agan Impact? Soon to Tell, ndustry Says

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — Information industry representatives, while enthusiastic about the prospect of four years of a pro-business, Republican administration backed by a Republican Senate and a fairly conservative House, are taking a wait-and-see approach to Ronald Reagan's actions on individual information issues.

Because Reagan campaigned on issues of the economy and national defense, he is expected to hit the ground running with proposals for tax cuts and enhanced military spending, both of which bode well for the electronics industry in general. But specific proposals for overhauling federal procurement practices and dealing with information policy have not yet been formulated.

The Reagan team is said to believe one fatal mistake President Carter made in the early days of his own administration was to get bogged down immediately in bureaucratic reorganization. Reagan, by way of contrast, hopes to go for some early big victories in pushing tax reform and beefing up defense capabilities.

The Carter administration has been very active in addressing such information issues as the Communications Act rewrite, privacy of personal records, electronic mail, paperwork reduction, industrial innovation and library

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NEWSPAPER

COMPUTERWORLD

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SYSTEM / CHARACTERISTICS	Amdahl Corp. 470V/8	Amdahl Corp. 580-5860	Amdahl Corp. 580-5880	IBM 3081
Relative Performance[1]	310	620	1,085	465
Memory Size In Bytes (Minimum To Maximum)	4M-16M	16M-32M	16M-32M	16M-32M
Purchase Price (Memory Size)	$2,775,000 (16M)	$3,800,000 (16M)	$7,500,000 (16M)	$3,720,000 (16M)
Monthly Lease (Lease Term)	$101,050 (4 years)	$88,300 (4 years)	$105,100 (4 years)	$93,000 (4 years)
Memory Cycle Time (Nsec)	260	Not Available	Not Available	Not Available
Machine Cycle Time (Nsec)	26	24	24	26
Channels (Minimum To Maximum)	12-16	18-34	18-36	16-24
Cache (Buffer) Size in Bytes	64K	64K	64K	2 CPUs, 32K buffer each
Bus Architecture?	No	Yes	Yes	No
Price per 1M Byte Of Main Memory	$37,500	$25,000[2]	$25,000[2]	$25,000

1. Relative throughput based on the IBM 370/158-3's equaling 45. Performance based on vendor claims.
2. Memory sold only in 8M-byte additions.

CW Chart

Amdahl Unveils Rivals To IBM 3081 Processor

By Tim Scannell
CW Staff

SUNNYVALE, Calif. — Amdahl Corp. last week introduced two computer systems billed as IBM 3081 competitors that offer users twice to more than three times the processing power of the firm's 470V/8.

At the same time, the company brought out the 470V/7C, an entry-level machine for the 470V/7 processor line that enables users to enter Amdahl's high-performance migration path for as little as $1 million, compared with the previous $2.3 million base price for a 4M-byte system.

Amdahl also announced larger main storage capabilities for the 470s and across-the-board purchase price reductions of 17%.

The Amdahl 580 Model 5860 uniprocessor and the dual-processor 5880 — code-named "Oslo" — are large-scale 370-compatible systems that both support the MVS/SP and VM/SP operating systems. The 5860 also supports the ACP operating system, Amdahl said.

The 5860 processor offers twice the processing power of the 470V/8 in typical commercial environments. Based on the *Computerworld*/International Data Corp. (IDC) throughput rating scale, the 470V/8's relative performance clocks in at 310, while the 5860 is rated at 620. By comparison, IBM's 3081, the 580's chief target, is rated at 465.

All of the relative performance ratings are based on the IBM 370/158-3 processor, which is rated at 45.

The 5860 processor is about 40% smaller than similarly configured Amdahl 470 packages, but has up to 32M bytes of main memory and up to 34 I/O channels made up of 32 block multiplexers and two byte multiplexers. The machine supports the data-streaming feature for all I/O channels

(Continued on Page 4)

System Generator Speeds Changes

By Rita Shoor
CW Staff

CHICAGO — The assignment was to convert approximately 300 programs from Easycoder to Cobol when IIT Research Institute (IIT) went from a Honeywell, Inc. Model 200 to a Prime Computer, Inc. 550 minicomputer.

In-house personnel included the DP director and three programmers without much more than a "smattering of Cobol" experience. An extra fillip was added by a decision to go from batch to interactive processing. And management wanted all this accomplished within 12 months.

In many shops, this combination would add up to a recipe for disaster, but that is not what is happening at IIT, according to Irwin Kusel, a consultant hired to manage the conversion project. Rather than following the popular approach of throwing lots of programmers at a project in a tight time frame, Kusel recommended that IIT obtain a Cobol program generator software package from David R. Black & Associates, Inc. Almost 11 months later, the recommendation is justified by the fact that Kusel still intends to make the Jan. 1 deadline.

The parameter-driven generator is a "badly named product," the vice-

(Continued on Page 6)

Large IBM Users Planning on X.25 Now

By Brad Schultz
CW Staff

LOS ANGELES — Whether or not IBM delivers X.25 compatibility to U.S. customers soon, some of the vendor's largest customers are writing X.25 into plans for network expansion right now.

Chase Manhattan Bank, which will replace a battery of aging Control Data Corp. M1000 mainframes as the basis of an expanded electronic funds transfer (EFT) network, will make the net compatible with the X.25 packet-switching interface as well as IBM's Systems Network Architecture (SNA), which does not accept the interface in the U.S.

See more on X.25 and other articles about network planning in this week's special report, "Networks: Planning and Implementation," which follows Page 58.

Chase Manhattan must replace the M1000s because CDC will withdraw service support after 1983, according to the man directing the expansion, Vice-President Peter M. Lacovara. Speaking at an Intelcom conference session here recently, Lacovara said Chase Manhattan needs X.25 to continue its extensive business in countries where the Consultative Committee on International Telephone and Telegraph (CCITT) recommendation is becoming necessary for high-volume data communications.

Although IBM continues to withhold X.25 compatibility domestically, other major systems vendors such as Honey-

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Gloves Now Required

TNF Forces IBM Service Changes

By Bruce Hoard
CW Staff

Despite its long-standing claim that the suspected carcinogen trinitrofluorenone (TNF) poses no threat to service personnel or users of the IBM 3800 laser printer, IBM has changed its service policy for the controversial machine.

A spokeswoman last week confirmed service technicians have been instructed to wear gloves when changing photoconductors, which contain and emit TNF. IBM is also adding labels describing proper use of the printer to photoconductors, developer containers and toner disposal bags.

In addition, the company is searching for a central disposal site for used photoconductors.

These changes come less than two months after IBM announced through a spokeswoman, "We consider these machines safe for users, machine operators and service personnel. No special precautions have been taken because we are convinced that TNF poses no health risk as used in these machines."

IBM has implemented the new service procedures in the interest of being "extra cautious," the spokeswoman said last week.

"Although we believe the photoconductors are not harmful, we want to eliminate any possibility that if they are left for normal disposal, they might be used in ways for which they are not intended," she said.

Some people have used the TNF-laden photoconductors for decorative purposes, and one person used one as a cover for a swimming pool slide, she added.

Never Told

In a related story, Jack Fleischer, an engineer who designed the optics for the 3800 between 1969 and 1973, claims he was never told about the existence of TNF or its possible dangers. He found out about TNF by reading *Computerworld*, he said.

Asked what his reaction was after reading about the chemical, the former IBM employee said, "I'm not unhappy enough to file a class action suit."

Another person more intimately involved with the 3800 photoconductor during its development claimed he was warned of the possible dangers of TNF. Bill Hausle, a laboratory specialist who frequently handled photoconductors, said "I don't recall any particular points of elaboration," about what he was told about TNF.

Hausle, who still works for IBM, was told the chemical was a possible carcinogen, he claimed. He did not know if, and what, other people were told about TNF.

The laboratory specialist, who wore gloves "sometimes" when handling photoconductors, would not say how many years he worked on the 3800 development project after he started in 1968.

Elsewhere there is evidence that more and more 3800 users are becoming increasingly uncomfortable with the printer.

Girard Bank of Philadelphia is replacing two 3800s with Xerox Corp. 9700 laser printers — ostensibly for economic reasons. The bank reportedly feels it can save up to 50% in total printing costs by moving to the 9700.

Equitable Life Insurance has ordered a Datagraphix, Inc. 9825 laser printer for a 90-day trial because the company wants to be covered in case the 3800 is definitely shown to be dangerous. "We're kind of up in the air about the situation," a spokesperson said. "We are looking into it and we are concerned about it."

Meanwhile, the Environmental Protection Agency (EPA) is still studying the latest round of TNF test-related documents submitted by IBM late this summer.

This latest submission — requested after two earlier submissions were found to be "inadequate" by the agency — will be reviewed and evaluated in a status report to be prepared by the agency.

The report is expected to be available sometime within the next two months.

Finding for IBM Upheld

SAN FRANCISCO — The Ninth U.S. Circuit Court of Appeals has upheld a district court decision that IBM did not employ illegal monopoly practices against Memorex Corp.

In a suit filed in 1973, Memorex sought $306 million in actual damages, claiming that IBM had violated antitrust laws by creating a monopoly.

During the five-month trial in 1978, Memorex charged that IBM was forcing it out of the computer peripheral business by releasing competitive equipment, changing existing equipment so that Memorex products would no longer be compatible and lowering prices below Memorex's.

A deadlocked jury at the trial had failed to reach a verdict and U.S. District Court Judge Samuel Conti, who said the jury was not competent to decide such a complex case, ruled for IBM.

A spokesman for Memorex said the firm would ask the appellate court for a full court rehearing. A full court would have the power to overturn the decision.

This Week

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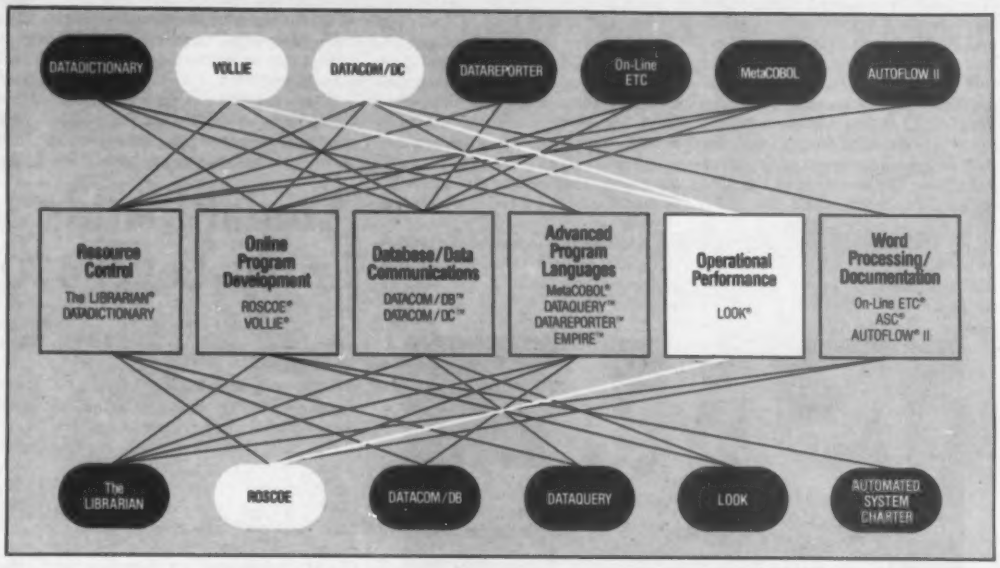

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Magnuson Competitor to IBM 4341-2 Bows

By Tim Scannell
CW Staff

SAN JOSE, Calif. — Magnuson Computer Systems, Inc. has unveiled a fully compatible competitor to IBM's 4341 Group 2 processor described as offering equal performance for three-quarters the price.

The M80/44 computer supports the same operating systems as the 4341-2, but in its basic configuration sells for $297,000, as compared with the $388,000 price tag for the IBM system. In addition, the Magnuson system has up to 16 I/O channels, while the 4341-2 has a maximum of six, and the M80/44 has a maximum main memory of 16 bytes — twice that of the IBM machine, a spokesman said.

The M80/44 is also said to offer from 1.5. to 1.7 times the performance of the 4341 Group 1 for 12% more cost.

Like the firm's previously announced M80/42 and M80/43, which were designed to compete against the 4341-1, the M80/44 has a 3M byte/sec data streaming capability that IBM features in its 4300 processor family. This capability reportedly lets the M80 series computers take advantage of IBM's 3370 and 3375 disk drives and 3880 controller.

Strategic Architecture

The price/performance and operating features of the M80/44 are made possible by the firm's "strategic architecture," a modular technology that links the processors' separate functions by a high-speed bus, the spokesman explained. In contrast, most competitive systems use a hard-wired technology that is said to be inherently less flexible.

In addition to supporting the DOS/-VSE, VS1, MVS/SP and VM operating systems of the 4341-2, the M80/44 supports DOS, DOS/VS and all releases of VSI and VM 370, which IBM does not, the spokesman continued. And because the Magnuson computer uses firmware to emulate IBM's instruction set, added functions are duplicated in microcode, allowing the firm to respond to IBM announcements within two months, in most cases, he said.

Current users of the firm's M80/31 and -32 systems can upgrade to the M80/44 as well as to the M80/42 and -43 systems.

All upgrades are performed by exchanging or adding circuit boards. No personnel retraining or software or hardware changes are required, the spokesman noted.

Finally, the M80/44 takes up about 25% of the floor space required by the 4341-2.

Like the M80/42 and -43, the M80/44 will not be available until the third quarter of 1981. Extra channels for the basic six-channel M80/44 cost $5,600 each and the standard configuration's 2M-byte main memory can be boosted in 1M-byte increments at $15,700 per megabyte, the spokesman said.

Additional information on Magnuson's 4300 series can be obtained from the firm at 2902 Orchard Park Way, San Jose, Calif. 95134

Amdahl Adds 3081 Rivals, Entry-Level 470V/7 CPU

(Continued from Page 1)

and is fully compatible with the 470 series processors.

The system reportedly incorporates a "pipeline" design that reduces the average number of cycles per instruction and permits a maximum execution rate of one instruction per cycle. The instruction pipeline also allows overlapping execution of about five instructions at a time.

Using random-access memory (RAM) technology, the firm has implemented distributed microcode in the system's instruction unit, execution unit, I/O processors, memory bus controller and console, the spokesman said.

The 5860 computer boasts dual 32K-byte high-speed buffers that are said to reduce the interference between the instruction fetching and execution processes. The computer's primary data paths are eight bytes wide.

I/O Processor

The computer's I/O processor (IOP) contains 16 block multiplexer channels. However, a second I/O processor can be added to increase the number of multiplexer channels to 32. While the first IOP has a maximum aggregate data rate of 50M byte/sec, a higher data rate can be reached with the addition of the second IOP, the spokesman claimed. Each block multiplexer can transmit data at up to 6M byte/sec. In addition, the system's byte multiplexer channel data rate is .2M byte/sec.

The machine's large-scale integration (LSI) RAM chips are intermixed with logic chips on the firm's multiple chip carriers (MCC), specifically designed for use in the 580 series. The MCCs are made up of 14 layers and can hold up to 121 LSI logic and RAM chips. One MCC can reportedly implement an entire system function.

Finally, the 5860 incorporates a hardware/firmware facility, Macrocode, that supports the system's machine and channel check capabilities. Macrocode can also accommodate more significant changes in the software interface than microcode and can be used to implement Amdahl-designated op codes, the firm said.

The 5860 with 16M bytes of memory and first-year maintenance charges costs $3.8 million, about $280,000 more than a similarly configured IBM 3081. Initial system shipments are slated for April 1982.

The 580 Model 5880 is similar to the 5860, but is a dual rather than a single-processor configuration. The 5880 reportedly has 3.4 to 3.6 times the power of the 470V/8 and can handle up to 36 I/O channels. The dual-configuration 580 machine has the same amount of maximum main storage — 32M bytes.

The 5880's relative performance rating, according to *Computerworld*/IDC calculations, is 1,085.

The Model 5880 sells for $7.5 million and is scheduled to be shipped in the second quarter of 1983.

Both 580 machines make use of microcode-controlled maintenance and checking functions such as enhanced maintenance analysis language, dynamic error analysis and an error logging routine.

Expansion Planned

The systems can run all currently available Amdahl software and future plans call for eventually expanding the systems' maximum main memory to more than 32M bytes.

The 470V/7C is an entry-level computer that has about 45% of the power of the 470V/7 processor. The system features 4M bytes of main storage, eight I/O channels, a 32K-byte buffer and a console display. The computer also has a 29-nsec machine cycle time, the same as that offered by the 470V/7 processor, Amdahl said.

The 470V/7 differs from the V/7C in that the earlier machine has a maximum main memory of 16M bytes and has up to 16 I/O channels.

The $1.05 million 470V/7C comes with 4M bytes of memory and eight I/O channels. Shipments are scheduled to begin in the third quarter of 1981.

In the area of memory, Amdahl announced that all 470V/5 and 470V/6 models in the 470 series can now be configured with up to 16M bytes of main storage. For all 470V/7 and 470V/8 processors except the newest model, the company will offer MVS/-SP support for main storage up to 32M bytes. Delivery dates for this support will be released in the first quarter of 1982, the spokesman said.

Amdahl is headquartered at 1250 E. Arques Ave., P.O. Box 470, Sunnyvale, Calif. 94086.

Cincom Offers Interactive Version of ENV-Data

By Marguerite Zientara
CW Staff

CINCINNATI — Cincom Systems, Inc. has unveiled an interactive version of its end-user data entry facility that reportedly provides immediate on-line operation, eliminates the need for specialized applications and allows for application prototyping on-line.

Competitive with IBM's Video, Turnkey Systems, Inc.'s Keymaster and Applied Data Research, Inc.'s Datacom/DE, the Series 80 ENV-Data is said to eliminate the traditional multistep process of designing input formats, coding the application, compiling and testing.

Replacing that process is an interactive function in which the operator specifies the data format and editing rules directly on the CRT terminal, and ENV-Data assumes the tasks of designing, testing and making applications operational "within minutes," according to a company spokesman.

All logic required to enter the data, edit it, return error messages to the operator and transfer the data to ENV-Data's on-line data base work files is built into the system.

Among the enhancements to the system is an advanced mapping system that defines screen formats and data-field edit criteria on-line "to improve turnaround time for new screen designs and provide better quality screen designs the first time," according to the vendor.

Another feature is ENV-Data's full integration with Series 80 Environ/1's Task-Level Recovery. In the event of a system failure, all data entry operations are automatically recovered and screens reset to the last valid screen entered.

A editing function — automatic file update of Total, Cincom's data base management system (DBMS) — is said to perform either a WRITE or ADD function and is supplied in Cobol-XT source code.

The release operates under Series 80 Total Release 8.1, Series 80 Environ/1 Release 8.1 or 8.2 and Total Information Systems (TSI) Release 1.2. For installations with DOS or OS with advanced mapping, the facility costs $11,055, with a $20,000 installation fee and $1,105 annual usage fee or $285/mo.

For installations with DOS or OS and non-Environ/1 customers with Total, the purchase price is $20,625, with a $4,500 installation fee, $2,062 annual usage fee or $530/mo rental fee.

For DOS or OS, non-Environ/1 and non-Total customers, the prices are the same as for DOS or OS non-Environ/1 customers, except that the installation fee is $5,500.

Cincom is located at 2300 Montana Ave., Cincinnati, Ohio 45211.

IBM Users Set Sights on X.25

(Continued from Page 1)

well, Inc. and Univac have recently said their network architectures will support X.25 and the International Standards Organization open networking model that contains it.

The nation's largest bank, San Francisco-based Bank of America, is also expanding its EFT network and also plans to have both X.25 and SNA, according to Lacovara's counterpart, Vice-President Randall C. Fong.

On a busy day, Bank of America passes $20 billion in assets through its worldwide network, Fong told the Intelcom session, and, like Chase Manhattan, the bank cannot stall its expansion planning until IBM gives its blessing to a de facto international standard.

The U.S. will bank on X.25, predicted Leonard W. Fernelius, senior vice-president of the Federal Reserve Bank in Minneapolis and director of planning and development for the Federal Reserve Communications System (FRCS) 80, which will drive the Fedwire EFT network through this decade.

As he described FRCS 80, for which procurement contracts will be signed this month, Fernelius said the facility will probably need X.25 to switch packets and interconnect with the many different bands of data terminal equipment (DTE) run by the nation's financial institutions.

The Federal Reserve System would be reluctant to order financial institutions to have X.25 between their DTE and packet networks, Fernelius said, but they will clearly need the interfacing to stay in business.

See a Need

Lacovara indicated that people like himself who must persuade bankers to buy systems are coming to realize that they need X.25 and open networking without understanding what such terms really mean.

"We would like to think of telecommunications as electricity that flows through a wall," Lacovara observed. "We want a utility we can switch on as needed."

The conference panelists said the Federal Reserve System has done a poor job of keeping financial institutions informed about the FRCS 80 project.

Xerox Unwraps System for Use With Ethernet

By Tim Scannell
CW Staff

DALLAS — Xerox Corp. last week announced an information system that allows users to create, process, file, print and distribute data within an Ethernet communications network.

The Xerox 8000 information system is actually a series of hardware and software products that work together to provide a number of services, from document storage to communicating with remote computer systems. The communications end of the system can even be used to link competitive office equipment into the same integrated Ethernet network, a spokesman claimed.

The 8000 system was designed to be used with the firm's previously announced 860 information processing system which can act as an office workstation in the network.

Four 'Servers' Featured

The system itself consists of four "servers" that provide a variety of office automation services. Those servers are the network communication file server, the network system file server, the network system print server and the 872 and 873 communications servers. Up to 1,024 servers and workstations can be linked to the same Ethernet network, the spokesman said.

The 8000 NS file server provides storage for documents and is a central point on the Ethernet network for receiving, holding and forwarding electronic mail. Rigid disks can be added to the unit with capacities of 10M, 29M or 58M bytes of storage, which amounts to 1,000, 4,500 or 10,000 pages of text, respectively.

The material stored by the file server can be various types of programs as well as conventional documents, the spokesman stated.

Print Server

The print server provides electronic printing capabilities and can churn out pages at the rate of 12 per minute. The printer server also has a processor to control operations, floppy and rigid disk storage, a CRT and a scanning laser printer. The printer has a variety of fonts and printing can be done in portrait or landscape modes using standard-size plain paper.

The communication file server provides three services and enables remote Xerox 850 and 860 systems to exchange electronic mail with 860 systems attached to the Ethernet network. It also permits several geographically separated networks to be interconnected by way of leased or manually dialed telephone lines. Third, the communications units allow users to refer to file and print servers by textual names, rather than by their internal network addresses.

The communication file server supports both half- and full-duplex modems and data rates up to 9,600 bit/-sec.

Finally, The 872 and 873 communications servers provide an external interface to remote workstations and host computer systems, allowing them to communicate with the Ethernet network. The 872 has four outside connections, while the 873 can handle eight. Data transmission rates are up to 9,600 bit/sec and the units can reportedly accommodate Teletype, IBM 2770, IBM 2780 or IBM 3270 communication protocols.

Deliveries of the information system components will begin in the first quarter of 1981. Purchase prices of system units range from $13,995 for the smallest communications server with software to $29,995 for a print server package. Lease prices for the same units are $605/mo and $1,135/mo. on a one-year agreement.

Except for the print server, hardware and software are priced separately. The firm also charges a monthly maintenance fee for the software, the spokesman said.

Additional information on the 800 system can be obtained from Xerox Office Products Division, 1341 Mockingbird Lane, Dallas, Texas 75247.

Generator Eases Cobol Conversion Process

(Continued from Page 1)

president of Superior Management Consulting Systems, Inc. maintained. "It not only generates Cobol code, it actually generates systems," he claimed. All IIT screens were completely generated with the package and the software was used to produce 70% to 90% of each report.

Programmer Productivity

While conceding that it obviously took some time for the programmers to become familiar with the various parameters required to utilize the data dictionary and the report writer elements of the program generator, Kusel was able to provide some rather impressive examples of how the package affected programmer productivity.

One programmer began working on the project on a contract basis in July 1980. His prior experience was on Burroughs Corp. systems and he "had never seen a [program] generator before." Between September and November, he succeeded in converting 50 programs involving 30 files from Easycoder to Cobol.

Another programmer was hired last February to replace one of the in-house staff members. His assignment was to convert the entire payroll system and "he made it on time," according to Kusel.

The system began running in parallel test mode on Sept. 1, in conformance with a schedule that had been set up more than six months earlier.

Kusel estimated that the entire consulting fee for the conversion of IIT's budget system was between $18,000 and $20,000. The institute may have saved as much as $80,000 because the consultant indicated that if he had taken on the same assignment when working for his previous employer — another contract programming firm — and had not used the program generator, fees for the necessary programmers would have run between $100,000 and $125,000.

One more example was given by George Vesely, the part-time consultant who joined the project in July. Vesely had just completed formatting a screen with more than 100 date entry positions. "It took about a day," he said. When asked to estimate how much time it would take to complete the same assignment without the program generator, he guessed at least 10 working days for someone who was already familiar with both Cobol and screen formatting.

Despite three positive results, IIT's programmers were not enamored with the software package when it was brought into the installation. Initially, "there was a very negative reaction," Kusel recalled. He countered this by requiring the staff to explain how they would handle each assignment if they opted not to use the generator.

Acceptance came most easily from the staff member with the least Cobol experience. "She went to it [the program generator] because she was essentially forced to. She learned the package with no problem" in about four weeks, Kusel noted.

Productivity Measurement

Rather than using the more conventional, but increasingly out-of-favor, method of measuring programmer productivity — number of lines of code written — the consultant defined productivity simply as "results. You give a programmer an assignment and a due date and he gets [the job] done." The time allotments for each project in the IIT conversion would have been much longer without the program generator, he said.

Structured programming played no part in contributing to the productivity statistics. "I still don't understand what's meant by structured coding," he said.

One of the relatively few problems encountered because of the generator is that management is losing all concept of how long it would take to complete a comparable project in a "regular shop." Since the package allows the staff to respond to most requests fairly rapidly, management can become "very insensitive" to system problems that have a negative effect on turnaround and cannot be solved within a short time span, he said.

Although he would recommend the package to any shop "as long as they'd really use it," he cautioned that the tool might be less than successful without strong internal management support. Given this support, his recipe for fast, successful program development was to purchase a mini and devote it to development work.

Any shop that followed this formula rather than tying up its mainframe with development and conversion projects would "get their return on [the mini] investment quickly," he said.

Program Product, Dial-Up Service

IBM Adds Double-Barreled Support for MVS

By Tom Henkel
CW Staff

WHITE PLAINS, N.Y. — IBM has taken two major steps to help users of its biggest operating system, MVS, solve their own software problems.

One is a program product available for a monthly fee and the other is a free dial-up support center — with an 800 number — that allows users to check their problems against a data base of known complaints.

The dial-up support center has been available to users of DOS/VSE, OS/VS1 Release 7 and VM/370 Release 6 for some time. It operates on two levels. Level one calls go to IBM support centers in Tampa, Fla., or Chicago where operators check the user's problem against a data base of common problems. Claiming most users' problems have already been identified, IBM said about 85% of MVS problems can be solved through the centers.

If the user's problem is not found on their list, the case is transferred to one of three IBM software development sites in Endicott or Poughkeepsie, N.Y., or Raleigh, N.C., where the problem will be studied in greater detail, IBM said.

Response from the second-level support force takes anywhere from two to 24 hours, one test user of the program said.

Information/System

A more primary line of MVS support comes in IBM's Information/System, an application package that runs on the TSO or NCCF interactive subsystems.

Information/System is divided into three parts: Information/MVS, Information/Management and Information/Access.

Information/MVS provides systems programmers with technical information about MVS for installing, supporting and tuning IBM systems, subsystems and components.

Information/Management is an integrated problem management tool to aid users in configuration management applications.

The meat of the Information/System is the Information/Access feature, which gives users direct access to IBM's Customer Software Support Facility (CSSF). CSSF is a data base that will contain IBM Approved Program Analysis Report (Apar) fixes and Program Temporary Fixes (PTF) along with preventative service planning information. In addition, users can use the CSSF to submit requests for corrective program fixes, bypassing the Level 1 part of the dial-up support facility, the company said.

Information/Access can be used by systems programmers through a variety of data input methods, help and tutorial facilities, the vendor said.

The facility also comes with a conversational dialog that allows less experienced users to work with the CSSF data base, IBM said.

The Information/Access Apar search facility allows users to submit requests for information on problems similar to users' current problems.

Information/Management can also be used to create a search augment to determine whether a given problem has already occurred at that installation. If such a search turns up negative, and the user still suspects the problem is in IBM software, the user can poll the Information/MVS Early Warning System to see if the problem is a newly discovered one, IBM said.

The Information/Access data base consists of one data set containing entries and a corresponding data set containing quick-search index for these entries. Consistency is checked each time an entry is retrieved to help preserve the data base's integrity in a troubled system.

In addition, if the entry data set is damaged, the user can recover by using journaled tries to a recovery log. If the data base is damaged by some external force, for example, it can be updated to the point last saved via the recovery log, IBM said.

Both the Information/System and dial-up support facilities are available on any IBM system running MVS Release 3.8. The MVS/Systems Products option need not be installed to use the support tools, IBM noted.

Both support facilities will be available starting in the first quarter of 1981.

The Information/System package will cost $243/mo through Dec. 31, 1982. On Jan. 1, 1982 the price will go down to $225/mo, along with reductions of about 40% in multiple product usage prices under IBM's Distributed Systems License Option.

The IBM support center is a no-charge addition to the service provided under IBM's monthly service support charge.

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AT&T Rivals Considered Better Off in New Senate

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — AT&T's competitors are "measurably better off in the House and significantly worse off in the Senate," as a result of Ronald Reagan's election victory, according to a knowledgeable source.

Rep. Tim Wirth (D-Colo.), who is likely to be the next chairman of the House Communications Subcommittee, "has a far better understanding of the industry's problems" than this year's chairman, Lionel H. Van Deerlin (D-Calif.), who lost his bid for reelection, the source explained.

Wirth is "likely" to introduce legislation next year which eliminates at least some of the shortcomings found by Bell's competitors in H.R.6121, he added. H.R.6121 is the Communications Act rewrite bill which Van Deerlin's group drafted earlier this year. It died later, mainly because of objections from the House Judiciary Committee.

Although Wirth cosponsored H.R.6121, our source insists he did so despite reservations about a number of provisions. In his new post as chairman of the subcommittee the congressman will be "in a much better position to implement his own views."

New Appointments

In the Senate, the Republican victory will almost certainly make Bob Packwood (R-Ore.) chairman of the Commerce Committee and is likely to put Barry Goldwater Sr. (R-Ariz.) in charge of its communications subcommittee. Both favor legislation which would prohibit divestiture of AT&T and limit the Federal Communications Commission's (FCC) discretionary authority to restructure the Bell System.

The new administration's views on telecommunications competition and regulation will almost certainly affect what Congress does in this area, but those views have not yet emerged.

While Sen. Goldwater is an influential member of the new president's inner circle, the group also includes two former FCC chairmen, Richard Wiley and Dean Burch, who are likely to favor a bigger regulatory role for the commission.

There is widespread feeling here that the Reagan victory will encourage a negotiated settlement of the Justice Department's antitrust suit against AT&T.

One communications attorney said he had heard rumors that lawyers for the two sides were already discussing details. Partly, the idea of a compromise settlement was inspired by the recently released report of a Reagan task force, established to recommend new regulatory policies. One of its recommendations is that major pending antimonopoly suits — such as the IBM and AT&T cases — should be "closely scrutinized."

Another straw in the wind is the FCC's Second Computer Inquiry decision. Recently, the commission reconsidered that decision, orginally deliberated last April, and decided for the second time that AT&T should be allowed to offer "enhanced" services through unregulated, separate subsidiaries.

Reaffirmation of this scheme could give the phone company some leverage in negotiating with the Justice Department.

Also, the commission's separation scheme is considerably less onerous to Bell than the terms imposed by Congress in this year's legislation.

Meanwhile, according to a former FCC attorney who maintains close contacts with his former associates, the government's trial staff has become progressively more ineffective, because of frequent changes in personnel.

The key point to keep in mind, says a veteran Washington, D.C., communications attorney, is that the Reagan administration reflects the viewpoints of the U.S. big business community. As a result, current FCC efforts to restructure Wats and do away with Telpak "will not be pursued." The attorney predicted the FCC's proposal to require resale and sharing of international private-line circuits will be quietly abandoned.

He expects this process to begin "about Jan. 20, when the President asks for the resignation of FCC Chairman Charles Ferris."

Within the next year or so, at least two other members of the commission — James Quello and Robert E. Lee — are scheduled to depart.

Reagan Planning Upgrade Of Air Traffic Control System

By Marguerite Zientara
CW Staff

WASHINGTON, D.C. - President-elect Ronald Reagan has indicated he plans to upgrade both the computers and personnel of the nation's air traffic control (ATC) system.

In an effort to both promote the growth of the aviation industry and increase airway and airport capacity to "the maximum safe level," Regan has called for "state-of-the-art [ATC] computers and radar systems," more air traffic controllers and modernized flight service stations.

Reagan said his plan "would include good maintenance during and after the installation, as well as a good backup system" and added the new computers and radar should be "adequately tested."

Reagan unveiled his plans in his response to a 10-item questionnaire sent out three months ago to presidential candidates Jimmy Carter, John Anderson and Reagan by the Aircraft Owners and Pilots Association (AOPA), headquartered here.

As for selection of an FAA administrator, Reagan said, "We should attempt to pick as administrator of the FAA and chairman of the NTSB people who have real aviation experience. We should choose someone from the aviation community who is familiar with the problems of the system."

Industry observers have noted that current FAA Administrator Langhorne Bond does not meet those qualifications. Therefore, it is "almost a given" that Regan will appoint a successor, according to Professional Air Traffic Controllers Organization (Patco) spokesman David Trick, although he had "no idea whatsoever" who that might be.

Patco Backed Reagan

Patco — the outspoken union that in recent years has brought national attention to the safety problems surrounding the antiquated and reportedly unsafe ATC computer system — was one of the few unions to formally endorse Regan in his bid for the presidency.

Now that Reagan has been elected, that support might pay off. In several press conferences held since the election Nov. 4, Reagan has indicated that controllers will not be subjected to "a total hiring freeze on Civil Service employees," according to Trick.

Stressing that Reagan's ATC hiring plans may not be "a direct result of the endorsement," Trick observed, "We'd like to think we were able to convince him that we were short-staffed and it's a matter of safety, not a matter of economics."

Industry Taking Wait-and-See Attitude

(Continued from Page 1)

and information sciences.

The Reagan administration approach to these and similar subjects will not be clear until the Republican team is firmly entrenched in the executive agencies and the congressional committee assignments are sorted out.

The biggest question is how the new Republican majority in the Senate will take shape, according to veteran Congress watcher Robert Willard, vice-president for government relations, Information Industry Association (IIA). "One of the big unknowns is the new people coming in," he remarked.

The Senate has so many committees and subcommittees that even freshmen legislators take over chairmanships, he noted. And in the House, there will be 74 new faces, making it just about impossible at this point to figure out how subcommittee assignments will be made, according to Willard, who said he is "following it as carefully as possible."

It *is* possible at this point to note the magnitude of some of the changes. Rep. Lionel Van Deelin (D-Calif.), for example, backer of the communications bill in the House was defeated, leaving the legislation's fate in the House uncertain. The Republican takeover of the Senate makes the outlook for the legislation there even more confused (see story on Page X).

Also, Rep. Richardson Preyer (D-N.C.), chairman of the House Government Information and Individual Rights Subcommittee, lost his bid for reelection. Preyer "had a broad understanding of information policy issues and was one of the few in Congress doing anything about them," according to Willard.

Preyer, "who in a quiet way accomplished a great deal," was instrumental in pushing privacy legislation and addressing transborder data flow and other information policy issues.

On the executive side of town it is really too early to tell, Willard said, but he suggested there will probably not be "any strong policy changes" from the Carter stance on most of these issues.

Little Change

Echoing Willard, Jerome Dreyer, president of the Association of Data Processing Services Organizations, Inc. (Adapso), said he foresees little change in the federal agencies' approach to information issues. He said he is "optimistic" about the new administration even though the Reagan regulatory task force has called for a one-year moratorium on federal regulations, possibly jeopardizing Adapso efforts to have the Federal Reserve Board restrain banks' entry into the DP services business.

Adapso, which has fought to protect smaller DP industry firms from what the association sees as unfair competition from such giant corporations as AT&T and Citibank, does not expect any great threat from the Republicans, supposedly friends of big business.

"Regulatory agencies, except for the top [personnel], don't change that very much" from one administration to another, Dreyer said. "The people who really run the show," the staffers, generally remain, he said.

But how much agency staffs are shaken up remains to be seen. Reagan, as California governor, took a strong interest in not only cabinet appointments but subcabinet staffing as well. With the possibility of deep changes in the Office of Management and Budget and the General Services Administration, as well as in the larger cabinet-level departments, important changes could occur.

Reagan chief of staff Edwin Meese has been quoted saying he expects the cabinet posts and top 100 administration positions to be set by early December, with the next 300 or so top jobs filled by the inauguration, by which time the situation could be clearer.

But with congressional committee assignments uncertain until mid-December and subcommittees unassigned until February, it could be as much as three months from now before a good picture of information policy for the next several years is evident.

Consequently, it is also too early to tell who will be the new administration members influential in information issues, according to Alexander Roth, Washington office director of the American Federation of Information Processing Societies.

Roth, another who is busily trying to sort out all the changes and identify key personnel of the new administration, noted, however, that the transition team is moving fast to set up shop and the Reagan influence in information policy could be felt even before the inauguration.

Roth, like others contacted by *Computerworld*, noted the number of unresolved information issues — Postal Service electronic mail, the communications bill and others — that will have to be addressed by the new administration and the new Congress.

If there was any consensus at all among these industry representatives, it seemed to be that many of the issues are nonpartisan in nature and are moving toward resolutions on paths unlikely to be drastically changed by the election.

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Start-Up Firm Debuts With Mini-Based Net

By Tim Scannell
CW Staff

BILLERICA, Mass. — A small start-up company here brought out its first computer product last week — an interactive processing system consisting of a series of dedicated 32-bit minis strung along a local network.

Domain — Distributed Operating Multiaccess Interactive Network — was announced by Apollo Computer, Inc.

The company was incorporated on St. Valentine's Day by top executives from Prime Computer, Inc. Digital Equipment Corp. and Data General Corp. Apollo's chief executive officer and president, John W. Poduska, was a founder, officer and director of Prime where he sported badge No. 006 in an employee cast of thousands.

The Domain system incorporates a number of complete minicomputers, or computational nodes, that can be used to swap data back and forth, send messages and interact over a 10M bit/sec coaxial communications network. Each minicomputer in the network is said to be comparable in performance to DEC's VAX-11/750 or Prime's 550 computers and can be located throughout a building or campus, a spokesman said.

The processor nodes, whose hearts are Motorola Semiconductor Products, Inc.'s M68000 chip, have from 256K- to 1M bytes of main memory and include a high-resolution, bit-mapped CRT display, detachable keyboard, three serial I/O ports, a network interface and operating system. In addition, each node can accommodate a 33M-byte Winchester disk drive and 1M byte of floppy diskette storage.

Information Access

The basic idea of the Domain system is that users in a several-node system can access data from a particular system without suffering any performance degradation, common to a multiterminal time-sharing network. Instead of having a series of terminals linked to a central CPU and scattered throughout a building, Domain offers each user a dedicated minicomputer that can be accessed or access information from other systems.

A typical system would consist of from 10 to 20 computational nodes, but users can link up to 200 nodes on a single network with very little performance degradation. Users can theoretically link more than 65,000 nodes on a single network, the spokesman explained.

Although the concept of dedicated yet distributed computers is not new and, in fact, common in some academic areas, Domain represents the first time the concept is offered commercially, the Apollo spokesman stated.

Domain's computational node has a fully associative virtual mapping system that translates a 32-bit virtual address into a 24-bit physical address, which is said to allow users to perform large problems. In fact, this ability to handle large computational problems is part of the reason Apollo chose to target the initial offering of the system toward the scientific and engineering arenas, as well as computer-aided design and computer-aided manufacturing applications.

'Multiple Window' Feature

A key feature of Domain is the system's high-resolution CRT terminal which can offer a "multiple window" view into the different software processes. For instance, the vertically designed screen can be broken up into a number of areas displaying such things as mailbox messages, a system menu or even graphics on the same screen image. The screen's image writing occurs at memory writing speeds of about one-sixtieth of a second to complete a new image. This reportedly compares to the 25 seconds required by a dumb terminal connnected to a time-sharing system to redraw a 3,000-char. picture at a 1,200 bit/sec communications rate.

In addition, the CRT terminal's "windowing" allows Domain's operating system to support multiple command environments simultaneously, such as a Basic environment in one screen area and a query-language environment in another, the spokesman noted.

Finally, the Domain system presently supports Fortran-77, an engineering language, and Pascal, a systems programming language. Both are optionally available from Apollo. Other languages will eventually be added as Apollo penetrates other markets — such as the educational, financial and commercial business sectors — with the Domain system, the spokesman continued.

However, it is not clear at this time which market will be targeted first, he added.

March Shipments Set

Initial shipments of Domain are scheduled for March and the company's first customers are Harvard University's Department of Computer Science, which will use the network for research purposes, and Rutherford Labs in Cambridge, England.

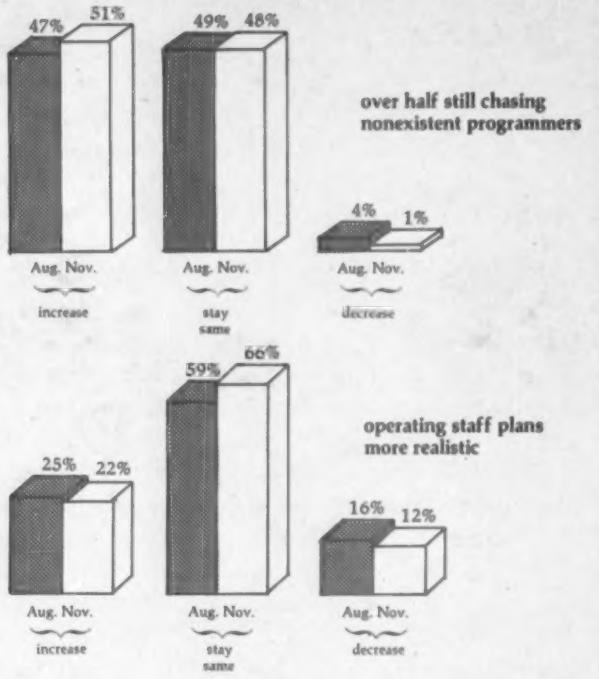
The system's computational node costs $24,000, while the Winchester and floppy disk expansion is priced at $10,000. Optional equipment includes a peripheral node adapter, which allows users to link a series of printers or tape drives to the network, and a tape drive and line printer.

Apollo Computer is located at 5 Executive Drive, N. Billerica, Mass. 01862.

The basic idea of the Domain system is that users in a several-node system can access data from a particular system without suffering any performance degradation, a problem in multiterminal time-sharing networks.

User Attitudes: They're Unaffected by Recession,

RECRUITMENT PLANS ARTIFICIALLY HIGH



- *Do you expect the number of systems and programming staff employed by your company over the next 12 months to increase? stay about the same? decrease?*
- *Do you expect the number of operating, data entry and control staff employed by your company over the next 12 months to increase? stay about the same? decrease?*

The demand for operating data capture staff fell 3% this quarter, reflecting users' continued takeover of this role. "The user pushes the buttons these days and does it as part of an existing job. It makes for a net decrease in staff," one DP manager explained.

The demand for analysts and programmers is far greater than the supply, however — and with staff expansion expectations up 4%, the chase for the few available ones looks like it will become even tougher.

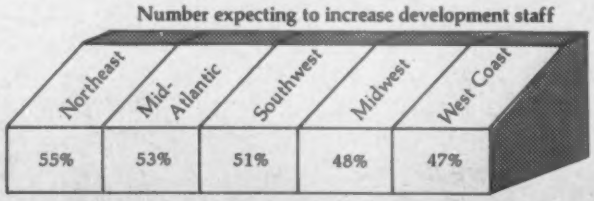
Interviews showed many installations are being constrained to hold the line on staff size. "We're consciously trying to stay the same. Where would we get highly trained staff, anyway?" one DP manager asked. "Low-grade application programmers are reasonably plentiful — but we didn't build up in the boom just so we wouldn't have to lay off now that it's tight."

This attitude, although realistic, is not typical. Despite the low success rate with recruitment, many sites still expect to solve their problems by increasing analyst and programmer staffs.

"I've got to recruit," one of those surveyed maintained. "We have scheduled work past a year for each of my staff. How can we cope with any new demands?"

As shown below, the Northeast has the heaviest demand for new staff.

Number expecting to increase development staff



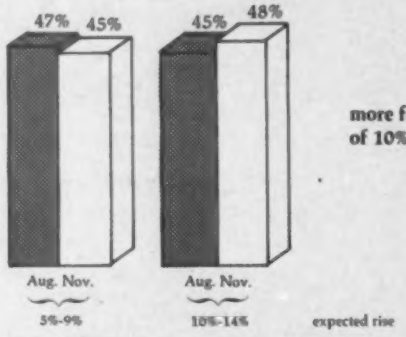
There's still no sign of recession in U.S. information processing: a substantial number of users are planning to increase their expenditures for both hardware and software, and the biggest issue facing MIS chiefs, they say, is meeting project deadlines — there's just too much to do in too little time with too few people.

That's what *Computerworld* and Urwick International Ltd., an international consulting firm, found in their second quarterly survey of computer opinion.

Who was surveyed? Before the first poll [CW, Aug. 18], Urwick sent out short questionnaires to MIS managers. More than 300 agreed to become part of a permanent panel.

Urwick went back to those 300 this quarter and asked them the same questions; here and on Pages 11 and 12 are the results.

SALARY EXPECTATIONS RISE SLIGHTLY



- *Do you expect the average salary of computer staff in your company over the next 12 months to rise? stay the same? fall?*

A slight shift in expectations of 10% to 14% salary increases is evident this quarter. As the table below shows, however, 48% of the DP managers surveyed expect their staffs' salaries to rise less than 10%, which is well below the consumer price index.

"We've got to keep within the 8.5% federal limit," one manager explained. "It's hard to live with, so we've given some promotions to get around it. It hurts, but we depend on government contracts."

The pressure to pay varies with location. "Many Long Islanders like to work near their homes. There's no trouble finding staff here — and keeping within the Presidential guidelines is no problem," the manager of a Long Island site noted.

Retail and distribution organizations expect to give the greatest salary increases; educational and research organizations expect to give the smallest.

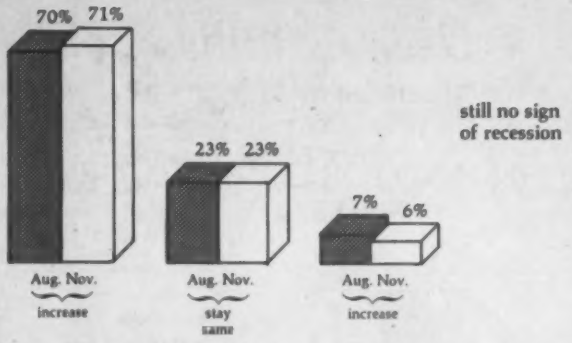
Expected salary increases

	stay same	1% to 4%	5% to 9%	10% to 14%	15% to 20%	more
Retail and distribution	0%	0%	31%	61%	6%	2%
Education and research	0%	2%	61%	35%	2%	0%
Total	1%	2%	45%	48%	3%	0%

But Harried by Deadlines

A Joint Survey Conducted by Computerworld And Urwick International

HARDWARE BOOM HOLDS UP



● *Do you expect the amount spent by your company on hardware over the next 12 months to increase? stay the same? decrease?*

A massive 70% of the users surveyed in the last quarter expected their hardware expenditures to increase despite the recession; this increase will be maintained, according to reports this quarter.

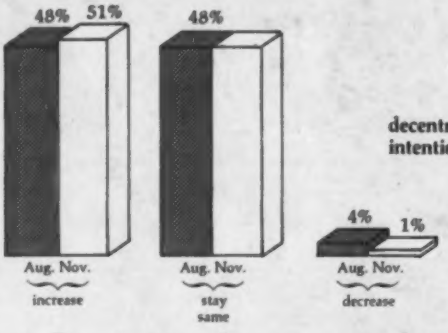
Some companies see expenditures for computers immune to general cutbacks and even believe they help achieve those cutbacks. "Computers aren't a luxury, they're a necessity these days," one user said. "Demand for new systems continues unabated, mainly because computers can save people."

Others — even though they also expect to spend more for hardware — are not so optimistic. "We're spending more on hardware, but not as much as the business plan called for," one of those users said. "I guess you'd call it a slowdown."

Another was even more pessimistic: "We're in a cutback situation and we're not making the expansion we'd like. I'm spending more because it makes financial sense; we can get more for the dollar today. I'd like to think we save people with each system, but the company doesn't see it that way."

Another installation feels the increased demand is entirely self-induced. "The business is stable; this demand for more hardware is pure Parkinson — programs grow to fill the memory available," the installation's DP manager said.

MORE POWER TO RELUCTANT USERS



● *Do you expect the amount spent by your company on user-controlled hardware, software and DP staff over the next 12 months to increase? stay about the same? decrease?*

Although 3% more of the users interviewed this quarter intend to decentralize, they made a point of noting that decentralization is not necessarily synonymous with distributed processing. User-controlled terminals are all that many DP managers plan to provide — and all that many users want.

"The accounting department doesn't want to expand or get involved in a level of work it doesn't understand," one DP manager explained. "It's pleased to give the work to us. Give the accounting people CRT terminals instead of batch and they're happy."

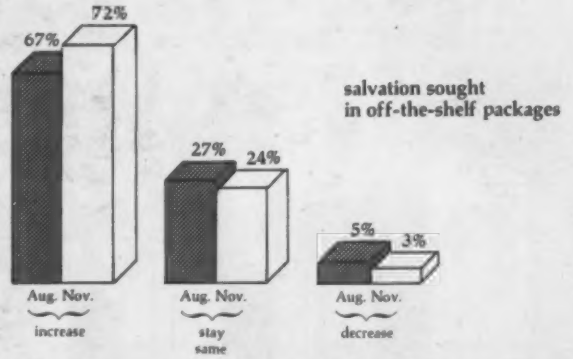
Why? User resistance was mentioned frequently as a reason. "Instead of looking at reams of reports, they're pleased to look up screens. The difficulty is to convince them they ought to input. Fifty is the average age, and computers aren't obvious to these guys as a benefit."

The intention to decentralize varied considerably according to industry.

Number intending to increase decentralization

Service bureaus	Engineering	Finance	Other industry	Retail/ distribution	Process industry	Public administration	Education/ research	Public utilities
75%	62%	57%	56%	54%	49%	48%	41%	39%

BIG MONEY IN SOFTWARE



● *Do you expect the amount spent by your company on proprietary and vendor software over the next 12 months to increase? stay the same? decrease?*

The number of installations planning to increase software expenditures rose 5% this quarter, demonstrating the hope DP managers are placing in ready-made solutions.

Even those not planning to increase their software budgets said that is only a temporary situation. "Our budget's staying the same, reluctantly — things are tough just now," a DP manager said.

Many users said vendor unbundling policies are forcing them to spend more. "IBM's bill just goes up and up," one remarked.

The great majority talked positively of saving programmers, either by improving productivity using program development software or by buying packages.

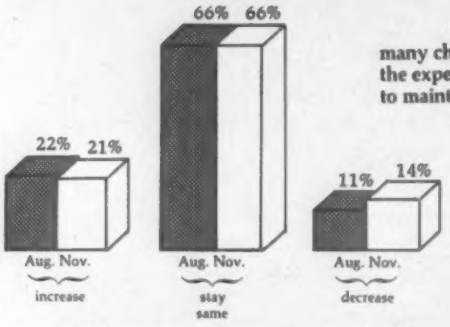
Source program on-line maintenance came in for praise: "We're going to get more from the guys we've got. On-line programming gives us a 2 to 1 increase in output."

Writing and testing programs is becoming more and more unpopular as the pressure on headcount and on target dates increases. "Our policy is to continue to purchase software. It's better than in-house software," one DP manager said. "Good people are always busy people. This way we buy time."

User Attitudes

(Continued from Page 11)

DEMAND FOR CONTRACTORS STEADY



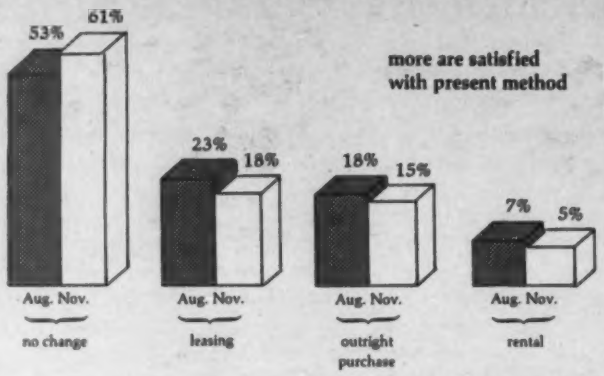
● *Do you expect the amount spent by your company on outside DP staff over the next 12 months to increase? stay about the same? decrease?*

The use of subcontractors, despite their unpopularity with DP managers, is expected to remain steady. Many managers complained about cost. "Recruit one person and get rid of one contractor — you've halved your bill," one said.

A correlation between the purchase of software and the use of outside staff was pointed out. "When you're no longer building it yourself, when you're directed toward buying software and fitting it yourself, then you're into contractors. It's temporary work," the DP director of one installation noted.

DP managers attributed the reason for using contractors this quarter to company policy on maintaining staff size. But, one manager complained, "We're going to pay a dear price for this. I don't prefer contractors; I've told my company this. You pay $100 to $150 and when they go, you lose all that learning curve."

SHIFT TO LEASING SLOWS DOWN



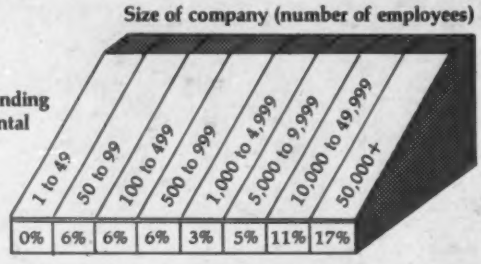
● *Do you expect the method of financing your hardware over the next 12 months to shift toward rental? outright purchase? leasing? stay the same?*

The number of installations intending to stay with their present methods of financing equipment rose 8% this quarter. This is partly explained by the fact that some have made the changes they said last quarter they would make.

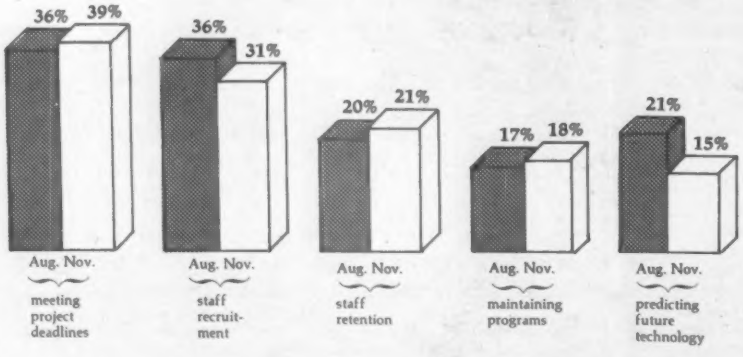
Leasing has dropped in popularity. "The technology is moving too fast to get wrapped up in a lease," one user commented.

Of those users which do intend to lease, the greatest number is composed of service bureaus (42%), followed by engineering users (30%), retail and distribution (24%) and public administration (23%).

The shift to rental correlates strongly with the size of the using company, as shown below.



MAIN WORRY: PROJECT DEADLINES



● *What is the major issue facing you at present — staff recruitment? staff retention? "go-it-alone" users? meeting project deadlines? meeting project cost targets? maintaining existing programs? evaluating present technology? predicting future technology?*

Meeting project deadlines is clearly the main issue confronting managers this quarter, with staff recruitment mentioned by 5% fewer installations than last quarter.

Artificial initial estimates was frequently given as the reason. "We have to face up to not knowing how long these things are going to take when we sign on. After three months — when we really understand what's wanted — we reestimate. And some programs we kill," one manager noted.

Staff retention replaced predicting future technology as the No. 3 worry. Staff turnover generally appears to be abating, but many feel this is a temporary phenomenon.

"It was 20% last year," another manager recalled. "I've lost none this year so far, but I have bad feelings about it."

Of those worried about future technology, office automation is one of the main concerns.

"We have a conceptual feel for how it should go, but we don't see anything offered yet. We can't live with three terminals on the same desk. I guess we have to get into it," one manager acknowledged, "but I know I'm going to be wrong!"

Other issues mentioned were "go-it-alone" users (14%); evaluating present technology (11%); and meeting project cost targets (6%).

'Why Pay Analyst or Programmer?'

Clerical Staffers Take On Data Dictionary Job

By Rita Shoor
CW Staff

PHOENIX — Why pay analysts and senior programmers to perform a task that high-level clerical workers can be trained to do? When Ann Christy from the Department of Economic Security (DES) for the State of Arizona asked herself that question, she answered it with the simple statement: "You don't need to."

In order to prove her point, the data base project manager is presently implementing a plan that will use non-technical personnel to do the actual physical loading of the Data Catalogue 2 (DC2) data dictionary recently acquired from Synergetics Corp.

"I just couldn't see paying an analyst or top programmer to do this kind of thing [describing data elements at the terminal]," she explained. After DC2 was initially installed, Christy "borrowed" a statistical clerk for three months. In addition to actually keying in data at a terminal, the clerk worked at filling in forms that defined the entities to be included in the data dictionary. The forms themselves had been previously defined by Christy.

Successful Experiment

Describing herself as "very happy" with the temporary loan of the clerical staffer, Christy said the experiment "proved the thoughts I had all along. There is no need for a highly trained technical person to accomplish this type of task."

The person loading the data dictionary would not necessarily have to be a clerk. It could be someone at a lower staff level in one of the DES user sections, Christy noted. DES users include employees in programs involving the administration of unemployment insurance, foster care, welfare, vocational rehabilitation and social service, among others she said.

While some of the systems associated with these programs are running on an in-house IBM 370/158, others are being executed on a Honeywell, Inc. H6000 computer at the state data center.

Since the two systems are incompatible, "I pushed for a plan that would allow us to first find out what data elements we have before we acquire a data base management system (DBMS). We must learn where the data elements are, how frequently they are accessed and how many systems use each element throughout the day," the project manager explained.

Dictionary First

Therefore, DES opted to install and load a data dictionary before deciding on a particular DBMS.

While training non-DP users was not a "weighty factor" in the decision to select DC2 over several other products, ease of use was a primary consideration, Christy noted. She estimated that training time for the clerical staffer involved in the three-month experiment was about 24 hours — or approximately three working days.

In addition to the savings she expected from the difference between programmer/analysts' salaries and those of clerical personnel, her approach will release the technicians for work on other projects, such as an upcoming operating system conversion from DOS to OS, she said.

Key analysts will be assigned the task of loading files, records, programs, modules and jobs from the 370/158s, she explained. Not only will this information serve as the first data entered on the data dictionary, but it will also be a training tool for the clerical workers who will do the majority of work involved in loading the data elements.

Explaining that DES is currently in the process of "acquiring the necessary positions from the state" for the new tasks, Christy said she hoped to bring some people in within the next few weeks. However, she was unable to project a completion date for the project because of such variables as staff availability.

Christy is "very happy" with the temporary loan of the clerical staffer. The experiment "proved the thoughts I had all along. There is no need for a highly trained technical person to accomplish this type of task."

Shift From Finance Department

Top Management Taking MIS Reins: Survey

By Bruce Hoard
CW Staff

BURLINGTON, Mass. — Top management is slowly but surely assuming more control over management information services (MIS), according to a survey conducted by Rath and Strong, Inc., a management consulting firm here.

General managers, presidents and executive vice-presidents now pull the MIS strings 20% of the time, with administrative vice-presidents and MIS vice-presidents in an even stronger position, at 28%, the survey found.

Operations, manufacturing and materials vice-presidents hold control 4% of the time.

The findings, which represent the opinions of about 50 general managers and presidents, also showed MIS control migrating rapidly away from finance departments, long the bastion of MIS control.

For example, in the 1960s, finance controlled MIS 80% of the time; in the 1970s, 60%; and the latest figures show a 48% control figure.

However, the respondents admitted having less control over software than hardware.

On a scale of one to five, the respondents' mean score for hardware control was 3.0, while operations and applications software control was rated at 2.6 and 2.0 respectively.

Two Categories

The survey questionnaire addressed two categories: divisions in the case of very large companies and whole companies in smaller organizations. Within each category, consumer and industrial products were broken out for one- to two-year and three- to five-year periods.

Under hardware, 43% of consumer produce manufacturers in the divisions category predicted they would have increased control over the one- to two-year period, while 71% agreed their control would increase within three to five years.

Fifty-seven percent saw no change in control in one to two years and 14% expected no change over the longer, three- to five-year period. No one predicted a decrease in one to two years, while 14% foresaw a control decrease within three to five years.

Cautious Industrials

Industrial producers reflected a more cautious attitude. Only 25% predicted increased hardware control over the one- to two-year period. Thirty-eight percent anticipated an increase over the three- to five-year period.

The industrial respondents' caution also showed up in the form of a 63% answer to no change in control for one to two years. That was 6% higher than the consumer side. Over three to five years, 56% expected no change, a whopping 42% increase over the consumer side.

Twelve percent of industrial producers predicted a decrease in hardware control over one to three years; none of their consumer counterparts did. Only 6% of industrials foresaw decreased control in three to five years.

When the company category was examined, the results flip-flopped, with industrial producers predicting more control sooner.

The move toward central control does not bode ill for distributed processing, according to the study. What it means is distributed processing will be tied into central systems.

Operations and applications software closely followed the pattern set by hardware. There were no predicitons of decreased control for the immediate one- to two-year period and far fewer than for hardware over three to five years.

Another Look

Looking at the figures another way, hardware is most easily distinguished from the two software categories by the low instance of respondents who rated their degree of control as zero or one on a scale of five.

Where most of the hardware respondents were lumped in the two through five categories, operations and application software respondents were evenly distributed across all five levels.

Rath and Strong cited an instance where, in the case of a $10 billion corporation with about 40 divisions, a corporate MIS manager inherited four different hardware suppliers, five different data base systems, three different communication systems and five different application software packages for similar operations.

Although such a diverse configuration might be successful, the consulting firm allowed, "one of each would have cost less, been easier to improve and better facilitated training."

Delta 153 Rocket Lifts Off With First SBS Satellite

Nasa Photo

The 116-foot Delta 153 rocket lifted off from Cape Canaveral Air Force Station at 5:49 p.m. Nov. 15. Aboard is the first Satellite Business Systems space vehicle, which is expected to allow point-to-point data communications as fast as 6.3M bit/sec.

By Brad Schultz
CW Staff

CAPE CANAVERAL, Fla. — A satellite that is reportedly capable of moving a 1G-byte data file across the nation in the time it takes to brew a pot of coffee slid into geosynchronous orbit 22,250 miles above the equator last week.

A McDonnell-Douglas Co. Delta 153 rocket carried the first Satellite Business Systems (SBS) vehicle, SBS-1, from Cape Canaveral Air Force Station to outer space just after sunset Nov. 15. The launch ended months of delay in getting SBS to first base with plans to offer specialized common carrier services for data, voice, video and facsimile communications.

The company — a joint venture of IBM, Aetna Life & Casualty Co. and Comsat General Corp. — had to scrap plans for stowing SBS-1 aboard the National Aeronautics and Space Administration's Space Shuttle, still grounded by technical problems.

Hughes Aircraft Co., which produced SBS-1, is already delivering the rooftop earth stations necessary to receive the all-digital services scheduled to begin sometime next year. While SBS-1 floats over the equator at roughly the longitude of Santa Fe, N.M., Hughes Aircraft is readying two other HS 376 satellites slated for launching in April 1981 and November 1982, respectively.

SBS-2 will serve as a spare, so some of America's largest corporations will not be devastated should something happen to their SBS-1 link in its first several months. But SBS-2 will eventually be an active link in its own right when the first satellite's capacity is filled; SBS-3 will then be a spare vehicle, according to SBS president Robert C. Hall [CW, Nov. 3].

The solar-powered HS 376 satellites expand in space to a height of nearly 22 ft and carry antennae that continuously point to earth. Their lifetime is said to be 10 years.

Users Cautioned on Extent of Trade Secret Law

By Rita Shoor
CW Staff

CHICAGO — If you are not personally involved in the development of computer software, you may be under the impression that the ambiguities plaguing trade secret protection for software programs do not affect you.

Not true, according to Miles Gilburne, a speaker at last week's National Software Protection Conference here.

Trade secret law has a potential impact on "virtually every party to a DP transaction," said the attorney with Los Angeles-based Blanc, Gilburne, Peters & Williams.

Software developers are obviously very concerned about trade secret protection for their products. They are also concerned about potential competitors hiring employees so that they can develop products to compete with the software the original firm developed and marketed, he said.

However, programmers and systems analysts are also becoming increasingly aware of the impact of a trade secret nondisclosure clause or a noncompetitive covenant on their mobility, he continued. It is extremely difficult to get high-powered technicians to sign these nondisclosure agreements because they are concerned with the effect of such an agreement on their subsequent employment, he said.

Software distributors who are licensees of the software developer and distribute the product to end users must be "wary of incurring liability to their suppliers by failing to maintain or to ensure that their employees maintain the confidentiality of their suppliers' software," Gilburne noted in the paper that accompanied his presentation.

End users are also subject to license restrictions in the same way as software distributors once they license the package, he said. The trade secret protection clause in vendor form contracts essentially tells the licensee that he must prohibit any access to the software and that he must prevent any unauthorized disclosure.

Practical Difficulty

"As a practical matter, it is extremely difficult to prevent an employee from taking a copy of that software and marketing it elsewhere," Gilburne said. Thus, if the buyer signs a contract with an "overly restrictive" trade secrets clause and one of the firm's employees "walks off" with a copy of the package to develop and market a competing product that causes the original supplier to suffer substantial business damages, the end users or distributor may be held liable for those damages.

Employers should be aware of the potential problems involved in hiring programmers and systems analysts who may use trade secrets belonging to their former employers, he continued. Corporations can be affected when acquiring businesses that are operationally dependent on software that could turn out to be misappropriated or nonprotectable.

Finally, a software vendor might become subject to a trade secret action that results in the issuance of injunctions that substantially impair the end user's ability to continue using the software or to obtain maintenance and future enhancements from the vendor, according to Gilburne.

Because "the applicability of patent and copyright protection in the software industry is very unclear," business will continue to look toward trade secret protection as a way to insure its investments, Gilburne maintained.

"It is also a fundamental tenet of our economic and social environment that competition be encouraged and that individuals be free to practice their chosen professions wherever and for whomever they choose," he said. Therefore, "every jurisdiction in the country has a very strong public policy against restrictions that cut down on postemployment mobility of individuals," he said.

Generic Knowledge

"If general knowledge that is generic to the profession is granted trade secret protection, competition in the industry that relies on the profession is going to be severely hindered," he said. This problem is particularly severe in the software industry where a clear understanding of the various interests of competitors, employers and employees demands a "high level of technical sophistication beyond that of most attorneys and judges," according to Gilburne's paper.

The majority of trade secret cases deal with the employer/employee relationship and this also happens to be the area that is most difficult to "get a firm handle on." Essentially, much of the law boils down to determining which areas of knowledge are specific and should be protected under trade secret law and which areas are generic to the industry and, therefore, should not be preempted from use.

The focus in trade secret software litigation should not be on whether the software was misappropriated, but rather on whether the trade secret elements of the software were misappropriated, he said. These elements include:

- Unique logic engineering and coherence of the software. Although packages may be functionally similar, there is an infinite variety of ways the inputs get translated into the outputs.
- "Headstart" elements. An investment in time and money may give a vendor a competitive advantage for the relatively short time the product is on the market without competition.
- Substantive uniqueness in application. Software is sometimes developed to automate an application that has never been computerized before. One example was the development of update parameters to detect abnormal conditions in catalytic conversion.

The employer who wants to avoid being the defendant in trade secret litigation would probably do well to maintain an awareness of current judicial trends, Gilburne advised.

Through In-House Efforts

Managers Clued on Cutting Recruitment Costs

By Jeffry Beeler
CW West Coast Bureau

LOS ANGELES — Many computing departments could significantly trim their recruitment costs by improving their internal hiring practices and thus cutting their reliance on outside employment agencies, two personnel recruiters for Southern California Edison Co. advised here recently.

One of the keys to upgrading a computing shop's in-house recruiting effort is to respond as rapidly as possible to solicited and unsolicited job applications and to minimize reliance on resumes as a personnel-screening tool, according to recruiters Susan Ellery and Bob Westmoreland.

In many large businesses, the routine for hiring programmers, analysts and other skilled computing personnel typically works as follows: a job applicant's resume arrives first at an employer's personnel office and then is forwarded in turn to each of the company's information-systems hiring supervisors. By the time the resume has run its course and is ready to be acted upon, as much as several weeks have passed, by which time the job applicant usually already has found work with another company.

Telephone Screening

Unlike most other recruiters, who evaluate an applicant's job qualifications primarily through his or her resume, Ellery and Westmoreland prefer to do most of their personnel screening over the telephone.

When they advertise for computing professionals in newspaper "Help Wanted" sections, the pair ask job candidates to reply by phone rather than by sending in their resumes. Each phone inquiry leads to a 30- to 45-min. "technical screening," during which Ellery and Westmoreland review a candidate's professional history and try to assess the suitability for the job opening in question.

If the candidate seems to have the right qualifications for the advertised position, the name and phone number are forwarded immediately to the appropriate hiring supervisor.

Using the telephone to screen job applications offers several advantages, according to these recruiters:

- It greatly increases the speed with which Southern California Edison can respond to applications from qualified job candidates. Previously, Edison often took as long as three weeks to reply to a typical computing professional's job application. Today, the turnaround time has been trimmed to just a few days, Ellery and Westmoreland said.
- It allows Ellery and Westmoreland to analyze a candidate's professional background, qualifications and career interests in much greater detail than would be possible with a simple one- or two-page resume.

The increased detail in turn has sharpened Ellery's and Westmoreland's personnel-screening skills and thus has improved their ability to fill Southern California Edison's job openings with highly qualified employees, the pair said.

Expenditures Cut

Partly as a result of their decreased reliance on agencies, the two personnel recruiters have managed to cut Southern California Edison's recruitment expenditures from a total of $354,000 last year to about $147,000 through the first 10 months of this year. At the same time, the average per-person cost of hiring the company's computing professionals has dropped from $2,950 in 1979 to $1,130 in 1980 — a more than $1,800 per head savings, Ellery and Westmoreland said.

The two personnel recruiters have managed to cut Southern California Edison's recruitment expenditures from a total of $345,000 last year to about $147,000 through the first 10 months of this year.

Payments to recruitment firms went from $220,000 for 38 computing professionals, to $106,000 for 16 this year.

"Most of our techniques for recruiting DP professionals are really quite simple and are based on common sense more than anything else," Ellery said. "As a result, the methods we've developed at Edison can readily be applied at almost any other company."

One of the key principles of Ellery's and Westmoreland's recruiting methodology is that they try to avoid hiring people to do jobs they have already performed elsewhere.

The two personnel recruiters soon expect to open their own consulting firm to teach their methods to other recruiters.

"Good programmers seldom change jobs just to get more money," Westmoreland explained. "They usually do so because they want a chance to improve themselves professionally, gain new skills, do new kinds of applications and increase their marketability."

For additional information about Westell Consultants, Inc. and its recruiting methods, write to Ellery and Westmoreland at Suite 201, 524 Esplanade, Redondo Beach, Calif. 90277.

IBM, HP Decide to Test Computer Store Market

By Tom Henkel
CW Staff

PHILADELPHIA — IBM has broken its traditional sales strategy by opening its first retail computer outlet here. While the firm formerly sold its products through a sales force that called on customers, the retail outlet will offer low-end small business computers and other office automation hardware.

Hewlett-Packard Co. also announced it is entering the computer store market.

IBM's retail outlet will focus mainly on the firm's line of typewriters and copiers, but its merchandise will also include more advanced items, such as IBM's Displaywriter word processing hardware and the 5100 line of intelligent business computers, a spokesman said.

The outlet will also handle other computer paraphernalia, such as printer ribbons and paper for yet-unspecified hardware.

IBM plans to open a similar store in the Baltimore area, along with several other stores, during 1981. However, a spokesman would not say where additional stores would be located.

IBM's marketing strategy seems to follow closely Digital Equipment Corp.'s experiment into the retail scene with its Computer Stores. While DEC says it is generally pleased with the results of its retail outlets, the firm has closed two stores in the past year.

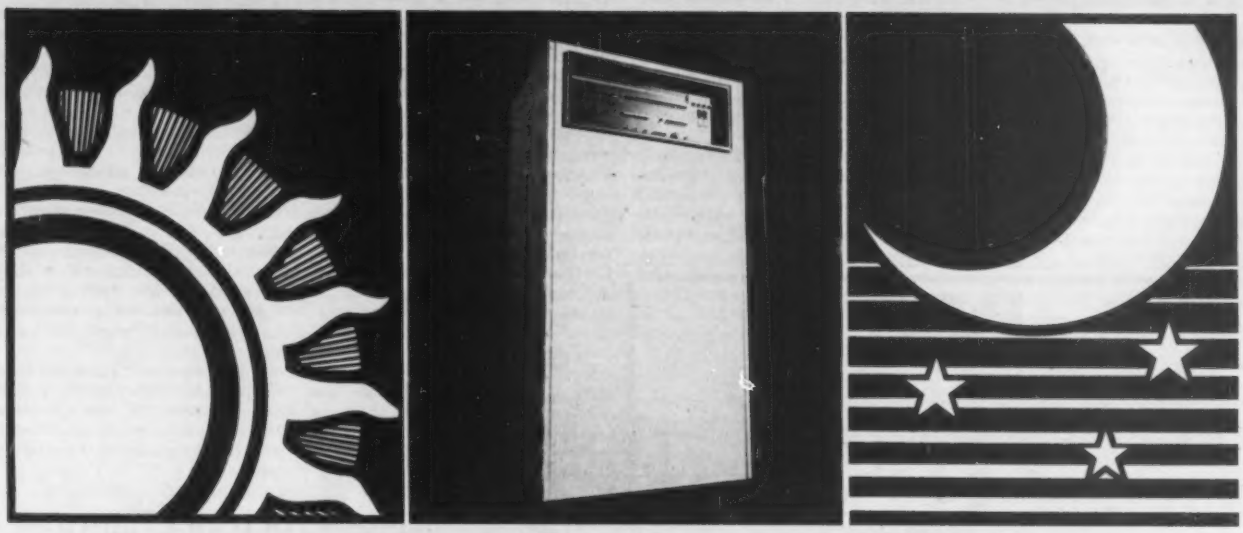
Two stores in New York were consolidated into one and a store in Detroit was shut down because of a faltering economy there, a spokesman said.

Hewlett-Packard Co. entered the retail store market through the back door with an agreement with ABC Computers, Inc. ABC will offer HP's 1000L series of small business computers.

Available through some 350 ABC outlets, the HP 1000L offers 128K to 512K bytes of main memory, a 15M-byte Winchester-type disk drive, tape backup and a CRT terminal; it supports the RTE-XL operating system. ABC will also offer business accounting software including accounts payable, accounts receivable, order entry, inventory, invoicing, general ledger and payroll.

The HP system costs in the neighborhood of $20,000, ABC said.

There are some things in life



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But there's more to the Memorex 1270 Model 8 Terminal Control Unit than reliability, flexibility, availability and cost effectiveness.* The specifications tell the whole story. For complete information about the Model 8, other 1270s and the entire Memorex family of display terminals and printers, contact Laurie McNeil at (408) 996-9000 or write to Memorex Communications, 18922 Forge Drive, Cupertino, CA 95014.

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*The 1270 Model 8 is available in the Continental U.S. only.

Programmer Fined $50,000 for Software Theft

By Ann Dooley
CW Staff

MOBILE, Ala. — A former service bureau employee here has been found guilty and fined $50,000 for copying his former employer's software programs and using them in a competing business he started.

The Circuit Court of Mobile County has found that Max Coffee, a programmer previously employed by Applied Systems, Inc., a service bureau with clients in Florida and Alabama, used programs taken illegally from Applied Systems after he left the company to open his own service bureau.

Although no conclusive evidence was presented proving Coffee had in fact duplicated the programs, a jury found enough circumstantial evidence to convict him. Coffee's lawyer, Herndon Inge Jr., plans to appeal the decision in the Alabama Court of Civic Appeals.

The jury reportedly made its decision largely on the basis of expert testimony that stated it would be impossible to recreate the programs so precisely in the short amount of time that elapsed between the time Coffee left his former job and the time he started his own firm.

The programs in question are customized business packages. As many as eight of Applied Systems' customers switched to Coffee's firm, Data Plus, Inc., which offered them lower rates.

Coffee formed his own company in January 1978. Although an injunction was immediately imposed to stop Coffee from using the programs, the case did not come before a jury until last month.

Unusual Jury

A jury trial is somewhat unusual in these cases, Gordon Tanner, the lawyer representing Applied Systems, said. However, the jurors were able to grasp the complex issues and deliver a fair verdict, he maintained.

The intangibility of software was an important aspect of the case, according to Tanner. The jury was called upon to decide whether a theft had occurred even though nothing was physically taken and the company still had the original tapes.

After hearing all the evidence, the jury decided that Coffee could not have recreated the identical programs in a short space of time.

Coffee and his lawyers maintained throughout the trial that he had originally developed the programs and that he had recreated rather than copied them once he left Applied Systems. Coffee's lawyers would not comment further because his appeal is still pending.

In the meantime, Coffee and his assistant, Robert Sawyer, who was also named in the case, can operate the business as long as they do not use the programs belonging to Applied Systems.

Program Helps Doctors Diagnose Rare Variety of Eye Malignancy

By Deborah Wise
CW Staff

CHICAGO — University of Chicago ophthalmologists have developed a computer program to aid in diagnosing a rare form of eye cancer that affects one out of every 14,000 births.

The disease, retinoblastoma, shares the common symptom of leukocoria, or white pupil, with many other eye diseases, but manifests itself as a malignant tumor that has to be removed. The other diseases are not treated in this fashion, so accurate diagnosis is very important.

Dr. Karl J. Fritz and his associates spent more than a year and a half updating and developing a data base originally prepared by Dr. Albert S. Leveille and others from a review of articles written about patient populations and leukocoria. The program "correctly predicted 14 out of 15 cases that we had here," Fritz said. "It is more accurate than doctors have been when they just look into the eye."

The program is running on the university's Amdahl Corp. 470 system, but is being adapted for an Apple microcomputer.

It is available on a time-sharing basis to any hospital capable of communications with the university computer. Fritz noted it is also available in a PL/I version.

"It is a general system, not just useful for one diagnosis. The data base is independent of the computational algorithm [Bayes' Rule]. It is a learning program and is such that the data base is modified when new information is entered," Fritz said.

Fritz said it is not limited to ophthalmology, but at the present time has only been used in the eye clinic.

The system could be extended to all areas of medicine, but accurate data bases would be needed, he noted, adding that his department does not have the time to construct these at present.

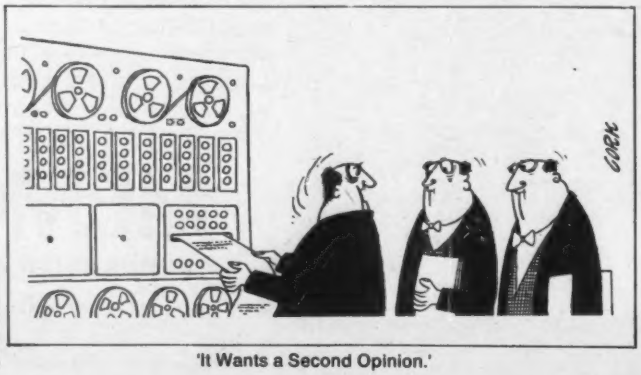
"It is essential that the data base be extremely accurate or it could lead to wrong diagnoses," Fritz said.

OCR Group Seeking Candidates for Award

HACKENSACK, N.J. — The Optical Character Recognition (OCR) Users Association is currently soliciting candidates for consideration for its third annual $1,000 Education Fund Award.

Potential recipients must be continuing their education in the electronic data processing field, with emphasis on applied data entry systems. Personal criteria should include any history of academic achievement, professional accomplishment, organizational involvement and social contributions.

Applications will be provided upon request by the OCR Users Association, 10 Banta Place, Hackensack, N.J. 07601.



'It Wants a Second Opinion.'

Key Technical Challenge

SBS Giving Priority to Local Net Development

By Jeffry Beeler
CW West Coast Bureau

LOS ANGELES — Local networking remains one of Satellite Business Systems' (SBS) key technical challenges and has received a high priority in the company's product development plans, according to SBS President Robert Hall.

SBS is jointly developing a high-speed, local-loop facility with Tymnet, Inc. and Local Data Distribution, Inc. (LDD) and expects the service to make its formal debut next spring, Hall said at the recent Intelcom 80 conference here.

Implementation of a local-loop capability will coincide roughly with the start of SBS' first customer services, which are slated to become available sometime "during the next few months," Hall said.

A local networking facility will provide a much needed terrestrial complement to SBS' planned family of data communications satellites, the first of which was scheduled to be blasted into orbit recently.

The satellite family, which will likely be rounded out by two additional launchings in April and November of 1981, is expected to be well suited to addressing the long-haul side of a user's data communications needs. But what about the short-haul side? After traveling thousands of miles through space from a sending earth station, how is a returning data stream going to be relayed the last two or three miles between a receiving station and the users at the end of the line?

The answer, of course, lies in the development and implementation of high-speed local loops. Satellites by themselves are simply ill equipped to provide the crucial links between earth stations and communications endpoints only short distances away.

In SBS' case, such short-haul data communications links will be made possible though cable TV facilities, fiber optics or perhaps other transmission "vehicles," Hall predicted.

Under the firm's current plan, one end of a cable TV line or similar data communications vehicle will connect to an SBS earth station through a special LDD interface, while the other end of the link will attach to one or more remote user facilities.

The interface will effectively enable earth stations and users at network extremities to communicate directly with one another through any one of several types of links at SBS's disposal, Hall said.

Hall's comments came during an Intelcom 80 panel discussion dealing with the subject of "business user networks." In other remarks during the session, the SBS president ranked flexibility as a network's single most important user requirement.

Flexibility, he explained, implies the ability to modify communications resources quickly and easily to meet changing business needs; add new capabilities without having to scrap existing facilities; and expand network capacity as circumstances dictate.

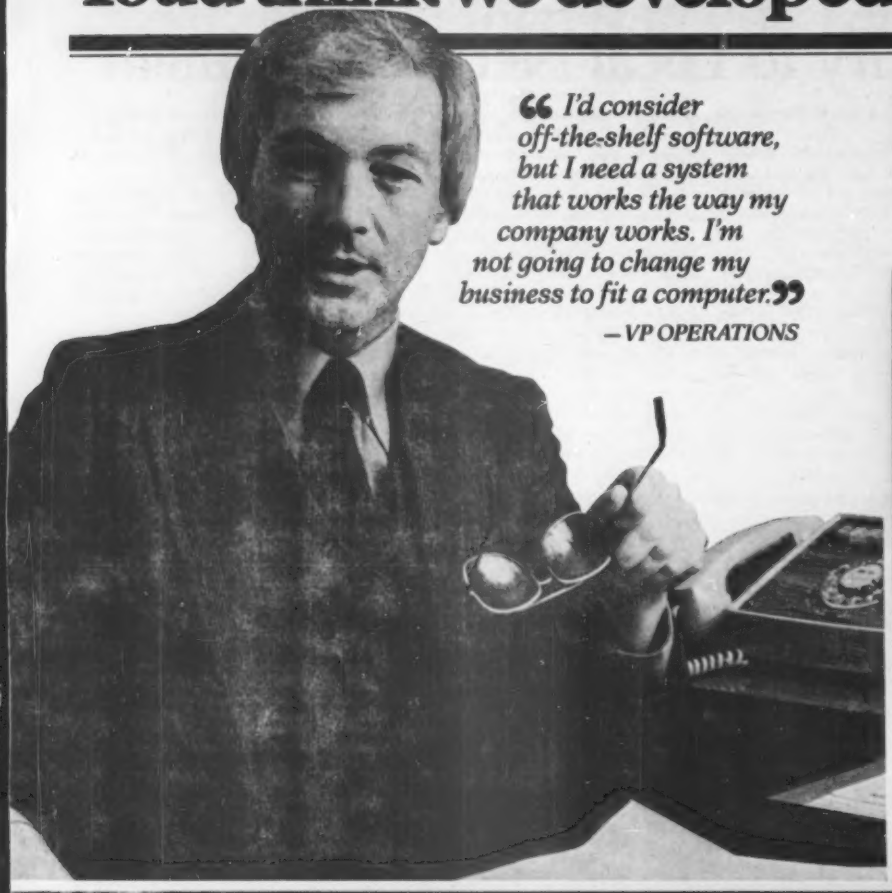
Pratt Studying Energy Factors In System Use

BROOKLYN, N.Y. — A study of the energy utilization characteristics of information processing equipment has been initated by the Graduate School of Library and Information Science at Pratt Institute.

The purpose of the study is to assess the current state of the art with respect to energy consumption to compare operating costs of various types of equipment, to develop guidelines to assist information systems analysts and to provide architects and other planners with guidelines for energy efficient design.

Project findings will be made available through a series of reports to be published next year. Further details about the research project can be obtained from H.J. Coopersmith or William Saffedy at the Graduate School of Library and Information Sciences, Pratt Institute, Brooklyn, N.Y. 11226

You'd think we developed our materials

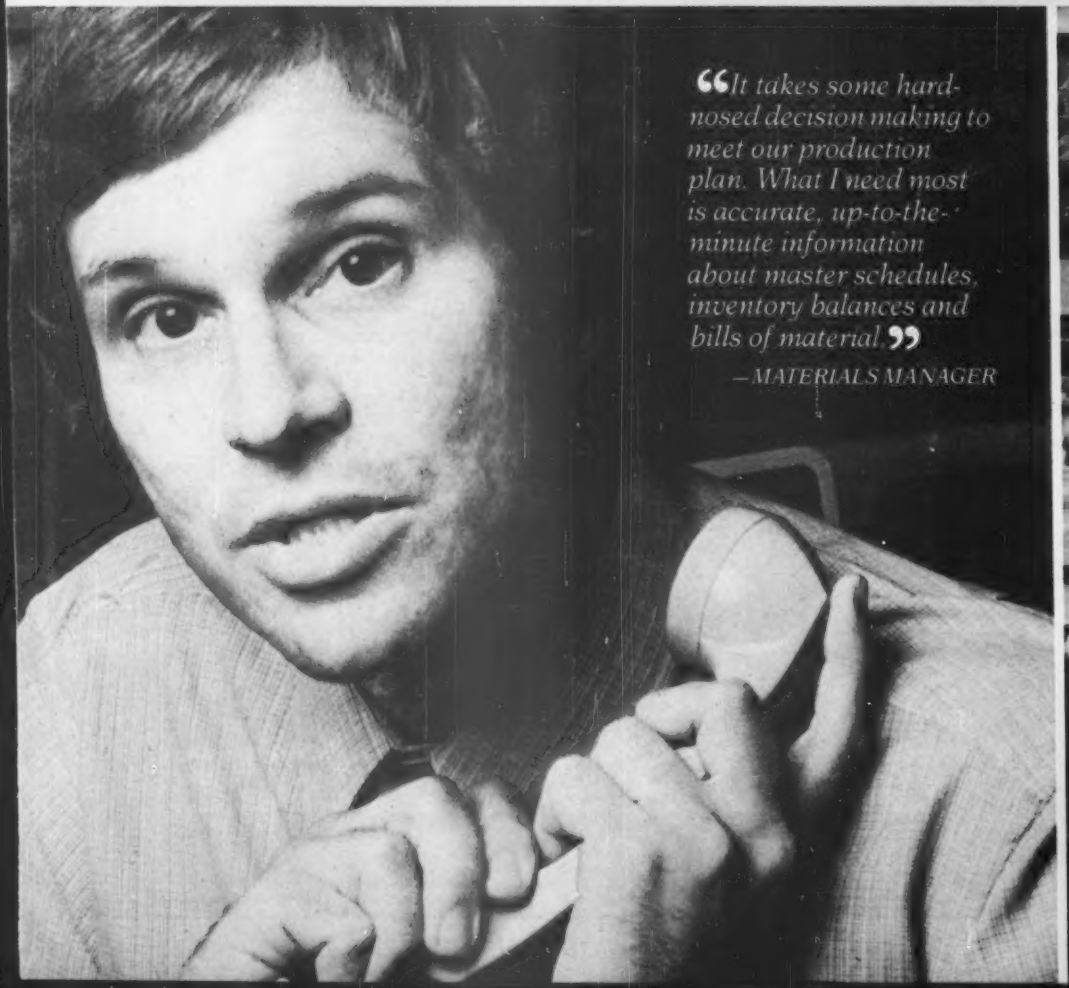


"I'd consider off-the-shelf software, but I need a system that works the way my company works. I'm not going to change my business to fit a computer."

—VP OPERATIONS

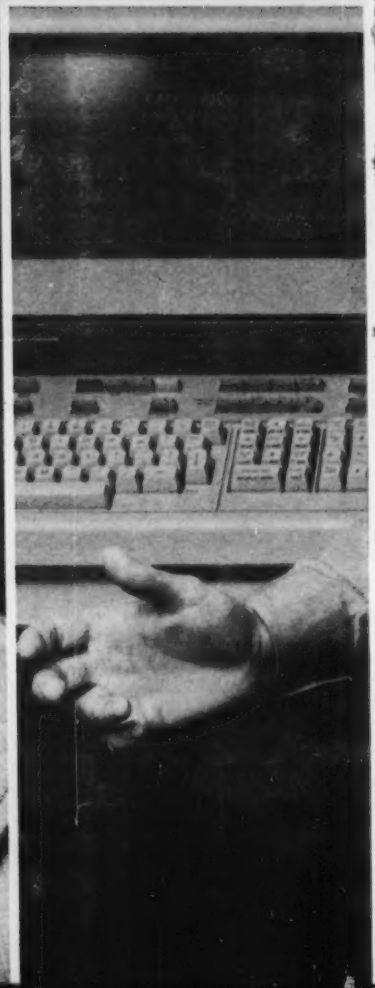
"All I can say is that the system better be easy to use. Here in the stockroom, we don't have time to become computer experts."

—STOCKROOM MANAGER



"It takes some hard-nosed decision making to meet our production plan. What I need most is accurate, up-to-the-minute information about master schedules, inventory balances and bills of material."

—MATERIALS MANAGER



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HEWLETT PACKARD

"Developing your own in-house materials system is one alternative, but it's an extremely lengthy, and costly, proposition. I need a system now, and one that won't tie up my programming staff."

—EDP MANAGER

47001HPG55

Under Aggressive National Policy

Brazilian Computer Market Now Sixth Largest

RIO DE JANEIRO, Brazil — In the wave of booming economic growth, Brazil has become the sixth largest computer market in the world and the second fastest growing after Japan. The dynamics of this expansion — an 880-computer population in 1972 grew to 8,000-plus by 1979 — can only be understood within the framework of a deliberate national policy to develop a domestic computer industry.

In 1977, almost all computers and associated equipment marketed in Brazil were imported and U.S. corporations accounted for approximately 90% of sales, though a good part of it was supplied from U.S. subsidiaries in European countries.

Today, less than three years later, there are some 50 industries manufacturing, at different levels of domestic technological development, more than 100 models of DP equipment corresponding to $500 million in sales in 1980 alone. The services and software industry includes 80 companies developing software products of various levels of sophistication and expertise.

How did this turning point come to take place? In April 1973, the Brazilian government created Digibras, the holding company and executive arm for the policies being drawn out by Capre, the Ministry of Planning's agency in charge of developing a domestic computer industry. In 1974, the first Brazilian computer company, Cobra Computers, became operational, and in 1977 Capre invited all interested computer companies doing business in Brazil to present projects for the domestic production of minicomputers.

It was recommended that the projects submitted to Capre meet the following prerequisites:

- Complete transfer of technology within five years (by the end of 1982) with license payments never to exceed 3% of net sales.
- Plans for participation in local markets as well as for export.
- Joint ventures with share control in Brazilian hands.
- Net reserve savings accruing from project implementation.

From the sixteen proponents, three were chosen and joined two other minicomputer manufacturers to operate in a captive market guaranteed by government regulations. As of 1977, sector-related imports were limited to amounts well below demand expectations and all requests have to be reviewed on a case-by-case basis by the government.

Mini Cornerstone

Minicomputers were the cornerstone of the initial development of the Brazilian computer industry. Basically they represent the fastest growing chunk of the market.

This boom in demand for minis is being churned up on two fronts. First, the natural expansion of companies has brought about the need for more capability and variety of applications.

As we have seen, the import of new equipment is tightly controlled, so there are users resorting to computer service companies for extra punch. But the squeeze on the CPUs can be alleviated also by shunting routine and time-consuming chores such as payroll, billing, and inventory control to minis linked to CPUs in a distributed processing environment.

Second, new computer users who have never before felt the need for DP embrace it in order to become competitive in a changing economic environment. The bulk of Brazilian computer customers are first-time users who naturally start with a mini.

Conflicts Develop

Most market trends in Brazil develop along these vectors. However, the complexity of this pattern has created some conflicts. In 1979, Capre was substituted by SEI, the Special Secretariat for Informatics, an agency reporting to the National Security Council and with wider attributions in terms of regulatory powers. This change in computer regulatory agencies occurred in the wake of severe economic hardships for Brazil as a whole and of growing pains for the computer sector in particular.

Pressures from all sides — private and government financial agencies, domestic manufacturers, multinational vendors, user groups and research centers — to adequately evaluate the flows of demand and supply in a regulated environment has brought SEI to the center of a heated debate on the near-term policies for the DP sector.

Less than three years ago, the discussion was on the pros and cons of creating Brazilian companies for the production of high technology equipment. Today, the issue is the consolidation of the domestic manufacturing structure already existent and whose importance can be measured by the figures mentioned above.

Domestic Components

Because computers are an assembly industry, however, true nationalization of the Brazilian computer industry will have to rely heavily on the future availability of domestically produced components.

Considering the size of the market and the complexity of the technology, the limited response of the present domestic production of components is understandable and, once again, forces other than the market's alone will intervene to stimulate domestic production.

Another sector that demands greater attention is software, basically applications software and monitors. Overcoming Brazil's shortage of computer capability using minicomputers will depend as much on the availability of software as on computers themselves, perhaps more.

Specialized software can be much more difficult to produce than the hardware that uses it. Innovation for many Brazilian users takes the form of new programming rather than breakthroughs in the computers themselves.

So, despite all the inherent problems of any young growth industry in a developing country, the Brazilian computer sector is alive, well and is coming through the '80s as a solid showing that Brazil means business.

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Auerbach Service Gains Section on Analysis

PENNSAUKEN, N.J. — In response to the need for improved requirements analysis and specification techniques, Auerbach Publishers, Inc. has created a section, "Analysis Methods and Tools," within its *Systems Development Management* information service.

Implicit design approaches, specification, explicit design and structured analysis are some of the topics examined.

Systems Development Management is a one-volume, $195-per-year information series, which is updated bimonthly. More information on the service is available from Auerbach at 6560 N. Park Drive, Pennsauken, N.J. 08109.

For Precollege Level

'The Computing Teacher' Debuts

EUGENE, Ore. — To help expand the use of computers in education, the International Council for Computers in Education (ICCE), a nonprofit corporation, has published a journal for people interested in computer instruction at the precollege level.

The Computing Teacher illustrates ways to use computers in teaching and gives methods for learning about computers themselves. It also covers the impact of computers upon the general curriculum.

The goal of the publication is to acquaint educational policymakers with some of the potential uses of computers in education and to encourage these policymakers to initiate actions that will lead to increased use of computers in their school systems, the publishers said.

Although computer use in schools is increasing dramatically, very little is being implemented in the area of curriculum improvements, according to *The Computing Teacher's* editor, David Moursund.

Each person who subscribes to *The Computing Teacher* becomes a member of ICCE. In addition to individual members, ICCE includes professional organizations working to enhance the instructional use of computers at the precollege level.

Early Growth

The publication began in May 1974 and was called the *Oregon Computing Teacher*. In the spring of 1979, it carried paid advertisements and evolved into an internationally circulated journal called *The Computing Teacher*.

Circulation averaged in excess of 3,200 during the 1979-1980 academic year and is expected to increase to an excess of 6,000 copies per issue during the 1980-1981 academic year, according to ICCE.

The publication currently offers seven issues yearly, but will increase to nine next year — and all contain a variety of articles and other material helpful to teachers using, or interested in using, computers. Subscription rates are $10 for seven issues, $20 for 16 issues and $27 for 25 issues.

More information is available from David Moursund, editor, *The Computing Teacher*, Computer and Information Sciences Department, University of Oregon, Eugene, Ore. 97403.

Pacific Tel Moving to Hike Private-Line Rates

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — Pacific Telephone and Telegraph Co. has completed the first step in what appears to be a campaign to raise its private-line rates significantly. Several other Bell operating companies are likely to do the same if Pacific Tel is successful.

Essentially, the company wants to impose a local access charge on customers who lease foreign exchange (FX), CCSA, EPSCS and tandem tie-line services. An FX circuit connects a user in one exchange area with all the telephones in another exchange area. CCSA and EPSCS are telephone company provided switching arrangements leased on a dedicated basis to companies with multiple locations. Tandem tielines are leased circuits connecting user-owned switching facilities in different locations.

The new charge would apply to all interstate subscribers leasing FX, CCSA, EPSCS and tandem tie line circuits which terminate within Pacific Tel territory. Circuits obtained from specialized carrier, as well as from a telephone carrier, are included. Most intrastate users of similar facilities would also be impacted.

Earlier this month, the California Public Utilities Commission (CPUC) went along with Pacific Tel's access charge plan. The next step is for the company to file specific rates. They are due around the end of this year. If accepted, the access charges would be imposed in stages, beginning 12 months after the tariff becomes effective.

Tariff Opposition

Some 18 specialized carriers, users and trade associations are fighting the tariff — notably MCI Telecommunications Corp., American Satellite Corp., the airlines, the federal government and the Tele-Communications Association, which includes several major U.S. companies.

The opponents contend that the access charge will actually cost far more than Pacific Tel has estimated.

The phone company is proposing a charge of $32.50- to $33.90/mo for each termination, but it says this rate is based on estimated circuit usage and may be adjusted later if further analysis shows a need to do so.

MCI contends that the estimated usage on which the proposed rates are based — 650 min/mo/local access line — is way too low.

"The simple fact of the matter, as Pacific must know, is that the average usage level is actually between 3,000 and 5,000 minutes per month," an MCI spokesman told the California commission. If the latter figures are used, "FX termination charges will increase as much as $500 per month, the spokesman added — or, $6,000/year for "the use of one telephone number."

Premeditated Effort?

It is "inconceivable that any experienced telecommunications company could in good faith" estimate 650 minutes as the average usage of a business-type access line, the company spokesman contended. Pacific Tel's "egregiously low estimate . . . seems part of a . . . premeditated effort to deceive . . . users and the (California) commission . . ."

MCI and other opponents also contend that Pacific Tel cannot impose local access charges without getting them approved beforehand by the Federal Communications Commission (FCC). They point out that many of the affected circuits are interstate.

Several months ago, the New York Public Service Commission authorized a similar tariff increase and subsequently was slapped down by the FCC [CW, Aug. 1]. The case then went to court, which upheld the FCC ruling. However, since the New York levy was applied only to out-of-state subscribers, California regulators argue that the decision may not apply to Pacific Tel's proposal.

They cite the FCC's conclusion in the New York case that, although it has jurisdiction over the local access circuits connecting interstate transmission facilities, the commission has deferred to the states so long as the rates charged local and interstate subscribers are the same — which they would be in the case of Pacific Tel's proposal.

Data Entry Said Alive and Well Despite Upheavals on Horizon

By Tim Scannell
CW Staff

ORLANDO, Fla. — Although there are changes, adaptations, and equipment upheavals on the horizon, data entry is "alive and well" and will probably play an important role in the much-heralded office of the future.

The data entry operator of today will probably be the data specialist of tomorrow, supporting and supplying information to several managers in a corporation instead of just one or two. Ryal Poppa, president and chief executive officer of Pertec Computer Corp., said. The office will become an entity in itself and the traditional data entry manager will be responsible for the entire office function.

Delivering the industry keynote at the recent Data Entry Management Association's (Dema) annual conference here, Poppa outlined where data entry has been and where it will go in the coming years. During his presentation — which consisted of a multimedia slide show complete with a professional soundtrack and theme song — Pertec's president spoke of a resurgence in the acknowledgement of the data entry function and a renewed importance bestowed on these unsung heros of information processing. As sights and sounds washed over the audience, the effect was as good as any created by Oral Roberts or Billy Graham.

The idea of the show was that like coal, trains, sailboats and cowboys, data entry would experience a 180-degree turn in importance and notoriety. Currently, two-thirds of the U.S. work force is engaged in some kind of office function, but at best the productivity rate rises only a few percent a year, Poppa explained. Therefore, "nowhere is the need for productivity more apparent," he said.

'Axis' of Evolution

Labeling data entry the "axis" of the office automation evolution, Poppa pointed out two trends that will come about in the near future. One, data entry personnel will adapt to new modes of processing by fitting into distributed processing environments and become information handlers. And two, hardware will achieve a commonality and emerge as multipurpose systems that are as flexible as the software.

The data entry person will have to become "a complete business person and not a remote specialist," he observed. "We will all have to have a much broader view of business and not only be concerned with how many batches you have to get out tonight."

The idea that the concept of a data entry operator is disappearing is true "only to those who imply limitations through definitions," he added.

The key to the future spotlight on data entry lies in software, "the limiting item and No. 1 requisite." Presently, Pertec is investing 68% of its research and development budget in software. In fact, this year marks the third year in a row that the company has reserved more than 50% of its budget for software, Poppa told the Dema group.

Ending his presentation with a Star Wars-like representation of a futuristic data entry station, complete with banks of terminals and hundreds of switches, Pertec's CEO explained that since most DP managers are too busy looking at the forest, it is up to the data entry person to provide a pertinent education of the all-important limb.

CW Photo by Tim Scannell

Ryal Poppa

Poppa Takes Crowd Down Memory Lane

ORLANDO, Fla. — In an effort to convince his audience here that he is "one of their own," Ryal Poppa, president and chief executive officer of Pertec Computer Corp., took them for a trip down memory lane.

In a scene reminiscent of the old "This Is Your Life" television show, Poppa recounted that he started out in DP 28 years ago operating an early card reader, earning $1.17 an hour. His job involved feeding cards into a machine that read them at a rate of 100 card/min. To break the monotony, he and a few of his fellow workers would stage a contest and see who could grab a punched card as it whipped through the reader without jamming the machine.

He then moved on to become a data entry operator, running an IBM 031 punched-card puncher, and in the early '60s began selling punched-card machines for IBM. He stayed about 10 years with IBM, spent a short time leasing data entry equipment and working for Mohawk Data Sciences Corp. and in 1973 joined Pertec as its president.

Throughout his career, Poppa was always involved with data entry equipment and he proudly describes himself as an industry "gray hair."

Program Result Off by $40,000

Error Overvaluates Property

MIAMI — Property values were wrongly assessed here recently when the Dade County Property Appraiser's office tried to apply more factors in a computer program than the program was capable of handling.

The errors were made for 127 lots of land that border or fall in the path of the new Metrorail public transportation project currently under construction. Each year the office appraises 550,000 lots.

"The error was in one of the programs that applies various depreciation factors for properties," said Tom McGovern, director of computer services for Dade County. He said the appraiser's office tried to apply multiple depreciation factors that the program did not have the capability of handling.

The tax assessments had not been sent out and the errors were spotted by auditors at Dade County Transportation office, which was making offers for the land in the path of the projected Metrorail service.

In most cases the assessments were only $2,000 to $3,000 over the correct value, but an auditor said one calculation was off by $40,000.

"We have increased the number of factors that can be applied in the program and will clearly instruct the Property Appraiser's office as to just how many factors can be applied at one time," McGovern said.

The computer services center developed the program itself and runs it on an IBM 3032 with 6M bytes of memory.

The areas that were affected were mainly in Washington Heights, a section of Dade County that saw the worst rioting during the disturbances earlier this year.

Or Face Loss of Transborder Access

Observe OECD Guidelines, U.S. Firms Warned

By Brad Schultz
CW Staff

LOS ANGELES — The U.S may lose access to transborder data networks in Canada and Europe if U.S. companies act contrary to certain privacy guidelines, a Commerce Department strategist has warned here.

Not legally binding, the guidelines recently set by the Organization for Economic Cooperation and Development (OECD) nevertheless show that America's trading partners see their sovereignty and economic health jeopardized by U.S. domination of information technology.

William Fishman, senior policy advisor with the National Telecommunication Information Agency, told a recent Intelcom conference session that privacy concerns among OECD member nations on both sides of the Atlantic have led some members of the trade reviewing body to limit transborder data flows, slowing international commerce.

The OECD nations, including the U.S., worry that data pumped to computers beyond their border may be secretly used to monitor activities of citizens and organizations. The networks may also carry misinformation — for example, designating the wrong people as credit risks, Fishman pointed out.

America's trading partners are especially concerned about transborder data flows to the U.S. because the U.S. has more computer power than any other nation, Fishman indicated.

While several trading partners have enacted comprehensive privacy laws bearing on data communications generally, the U.S. has mandated privacy protection on an industry-by-industry basis, he continued.

Strictly economic concerns add to the impetus for statutory controls on transborder flows. Some nations find they are losing jobs when they transmit data to the U.S. for processing, Fishman noted.

Despite the intensity of these problems, six of the 23 OECD nations did not adopt the privacy guidelines. Only Canada objected to a "free flow" provision calling on nations to share access privileges equitably, Fishman said. Canada is trying to reduce its dependence on the processing resources of its southern neighbor.

OECD Guidelines

The OECD guidelines specify that data not be stored without reason and that the reason for storing data cannot be changed after the data is acquired. The guidelines also specify that data on individuals cannot be manipulated without their permission, that it must be of "good quality" and that individuals have a right to see what data relevant to them is subject to transmission.

Under the guidelines, responsibility for proper handling of data transmitted across borders rests with the companies that profit from the transmission, Fishman stated.

Legislation is not necessary to implement the guidelines, he observed, but violations may provoke some nations to press for privacy-oriented treaties as a condition for retraining links with the violating nation. A sudden rush to regulate and restrict transborder flows could seriously hurt international commerce, Fishman warned.

Prestel International Discussed As Among Videotex Innovations

By Phil Hirsch
CW Staff

ATLANTA — Prestel International was one of several recent innovations in videotex technology described at a recent communications conference here.

Launched last March, the service has about 145 users in seven countries, including the U.S.

One application involves distribution of information among a multinational company's dispersed locations. A major British software company, for example, uses Prestel International to transmit information to its field technicians. Soon after a bug is reported in one of the company's software releases, Prestel International provides each technician with a description of the problem, a brief instruction on how to fix it and reference to further information.

Prestel International also distributes general and specialized information provided by commericial data base vendors.

Among these are Lloyds of London, which publishes a daily report of international container ship movements, and various business news organizations providing frequently updated listings of securities and commodities prices.

Invitation Only

Until next spring, Prestel International will be in test mode, and available on an invitation-only basis, Marketing Director Tim Cooke explained.

The service is a joint venture of Logica Ltd., a British consulting firm, and the British Post Office (BPO), which developed viewdata, the world's first commerical videotex system. Within the UK, Viewdata is known as Prestel. The Logica/BPO joint venture, although using separate computer facilities, employs the same searching/indexing scheme as the domestic service.

Cooke stressed that there are advantages as well as limitations to using the viewdata system for on-line business applications. Lack of real-time update capability is one drawback, another is that the search scheme can be "cumbersome" with a large database. The Prestel International database, he added, consists of approximately 7,000 information frames.

A major benefit of Viewdata, he added, is its cost in comparison to other on-line storage/retrieval schemes

One of Prestel International's information providers is a worldwide hotel chain that accepts reservations through the system. Cooke presented figures showing that the total cost of putting this application on-line was far less than a service bureau would have charged — specifically, $15,000 vs. nearly $60,000.

He also reported that his own company, Logica Ltd., uses an on-line service bureau to maintain its payroll records. The overall cost of this service is $3/min. "The cost of a similar viewdata service, at 6 cent/min for connect time, $10/year frame rental and a $10,000 annual subscription fee would work out to $1.40/min," Cooke said.

Viewdata's big advantage for business applications, he indicated, is its ability to make frequently changing information instantly available to widely dispersed users at a low unit cost. It fills a gap between telex systems, which are simple to operate but have limited data base searching capability, and large, time-shared, research-oriented information retrieval systems that employ sophisticated but expensive indexing schemes.

'This Is *Not* Going to be One of Those Quick, Civilized Divorces.'

Underground Mini Could Avert Mine Disaster

WALLACE, Idaho — A northern Idaho silver mine is using a minicomputer at its 4,000-foot level to develop for the first time a method of predicting rock burts, the small seismic events which plague deep and hard rock mines.

The study's results will not only increase mining safety, but could ultimately lead to prediction of large-scale earthquakes as well.

Galena Mine, managed by Asarco, Inc., is one of five major silver operations in Idaho's Coeur d'Alene district. By using a minicomputer to capture and analyze sufficient seismic data, Galena hopes to outline areas where ground stress is on the verge of violent release.

Knowing where and when these bursts are likely to occur could reduce the potential for injury and even death that is present in mining operations. Where rockbursts can be prevented, Galena will save time lost to repairing small and large bursts — a rockburst several years ago damaged a working area, and mining crews spent two years repairing it.

"When we see one spot in an area that looks critical, we notify the mine manager," the rock mechanics engineer for the mine said. "We're not always correct, but there've been times when miners were pulled from a work area. Other times, they've done destressing. That is a method to relieve pressure by drilling holes to either fracture the rock or cause it to burst in a controlled situation."

The rock mechanics engineer, who is a graduate mining engineer, was cautious in his evaluation of the project. "It's hard to gauge our success because there isn't much to compare it with," he said. "In the past, we had to take it for granted that rock bursts were going to happen. Now, at least, we're doing something about it."

Expanding Field

Although this field of rock mechanics — known as microseismics — has been around since the 1920s, the technology to take advantage of it has not been available until the last five to 10 years. "Now with computers that can collect and process data rapidly and the special sensing devices, this research is expanding," the engineer commented, adding that similar projects have started up in Pennsylvania, Australia and South Africa.

Asarco's mini, a Data General Corp. scientific Eclipse S/230, works with signals received from 30 geophone sensors cemented to walls through the mine. To avoid problems with running sensor cables up the main shaft, Galena built a computer room at its 4,000-foot level complete with air conditioning and fluorescent lighting.

The mine installed the Eclipse S/230 with a memory storage device, 30 char./sec printer and Dasher CRT screen with keyboard.

The Eclipse basically monitors the changing equilibrium of ground stresses by processing signals from the geophones. As these sensors detect rock noises or vibrations from shifting ground, the computer determines the source location for each noise.

The information is both printed out and stored in the computer's memory for future reference. With a growing history of seismic activity for various mine areas, the engineer can determine noise patterns and study them for anomalies, a potential danger sign.

The Galena Mine covers about two miles east to west, is 4,900 feet deep and has a total production of 725 tons of ore/day. Each ton, processed through crushers and flotation cells, yields approximately 20 oz. of silver and seven-tenths of 1% copper.

"The miner's safety is our primary concern in attempting to predict rockbursts," the engineer commented, "but of course productivity is important to us, too. By studying our event history, we hope to come up with a well-defined methodology to guide us."

Galena's computer room, located within the mine itself, is equipped with air conditioners and filters to keep down damaging heat, humidity and dust.

To this end, the computer monitors the mine 24 hours a day, seven days a week. A timing device within the computer accepts the geophone signals for a predetermined interval, creating an "event window."

The engineer programs the computer himself, using Fortran, to produce histograms, maps and accumulation curves to better interpret patterns and abnormalities.

Model to Aid in Spotting Businesses Near Failure

COLLEGE STATION, Texas — Two professors at Texas A&M University here, building on a research concept of the early '60s, are developing a computer model they hope will produce a set of indicators able to forecast potential business failures.

"What we're trying to test for is firms that have the economic characteristics of failing firms," Dr. Gary A. Giroux, professor of accounting, explained.

Giroux and his associate, Dr. Peter Rose, professor of finance, use information on thousands of companies provided by Compusat Services, a subsidiary of Standard and Poor's Corp., and Security and Exchange Commission reports.

By using a technique known as multiple discriminatory analysis, this information is compared with about 200 financial indicators, such as a company's profit margin, size of debt and other balance-sheet particulars. The professors hope to come up with a set of equations that classify fail and nonfail firms.

The model is being tested in the DP department of Texas A&M on an Amdahl Corp. 470V/6 mainframe.

Back in 1960, Edward I. Altman, a professor at New York University, developed a similar model called Z-Analysis.

"Our approach is basically similar," Giroux said. "Our data analysis is a little more complete. We're using more years and we're using a considerably larger data base."

When perfected, Giroux said, the model will not be commercially marketed, but used to help companies recognize early signals of disaster.

Instead of Public Seminars

Consultants Offer Alternative Training Plan

By Jeffry Beeler
CW West Coast Bureau

DANVILLE, Calif. — A northern California consulting firm is offering computing professionals an alternative to public training seminars, which are often criticized for their irrelevance, overcrowdedness and lack of specific information.

The proposed alternative will provide information systems personnel with an opportunity to attend a wide selection of educational seminars, workshops and conferences that will differ from more traditional programs of computing instruction in at least three important respects.

First, the training program will strictly limit seminar and workshop attendance in an attempt to cultivate group rapport and thus stimulate interaction and information exchange. Second, the plan will reportedly give seminar and workshop attendees an opportunity to customize their course of study to meet their unique professional needs. Third, course materials will reportedly cost $90 per student-day, roughly half the price of many typical public seminars.

Education Consortium

Developed at the consulting firm of Kapur & Associates, Inc. based here, the alternative training program will be implemented through a so-called Education Consortium, a newly formed society of computing professionals and senior executives united by a common interest in increasing their knowledge of software engineering, structured methodology, programmer productivity aids and related topics.

Members of the consortium will represent a broad spectrum of large and medium-sized companies ranging from banks to insurance firms to manufacturing outfits. At present, the group boasts 10 member organizations, and consortium founder Gopal Kapur reportedly intends to limit membership to about 30 companies.

Among its chief benefits, the consortium offers members an opportunity to:

- Attend up to 16 one-week seminars and workshops covering topics like structured analysis and design, effective management of computing projects, structured programming, methods for conducting walk-throughs, structured testing, the development and implementation of structured programming standards and procedures and techniques for cutting maintenance requirements.
- Join the consortium's Education Committee, which controls the form, content and scheduling for each of the instructional seminars and workshops.
- Take part in an annual one-day Executive Seminar aimed at updating technical and nontechnical management about the latest developments in software engineering, structured methodology and programmer productivity.
- Attend a Structured Methodology Users Group conference, an annual one-day event that will give participants an opportunity to hear formal presentations and exchange ideas and information with fellow members.
- Take advantage of an information clearinghouse and newsletter.

The consortium's Education Committee will consist of one representative from each of the participating organizations and will meet at least twice yearly to give members an opportunity to reassess the group's instructional needs, Kapur said.

The Education Committee and information clearinghouse will be reserved for consortium members only, while the remaining services will be open to a limited number of nonmembers.

To join the consortium as a full member, organizations will have to pay a $500 one-time-only joining fee plus $325 per year in membership dues. Seminar seats cost $90 per day for a minimum purchase of 60 student-days of instruction.

For charter members who join the consortium before Dec. 31, special discount membership rates will be available from Kapur & Associates at 776 El Cerro Blvd., Danville, Calif. 94526.

FAA Inks Arts IIIA Pact Despite Patco Criticism

WASHINGTON, D.C. — The Federal Aviation Administration (FAA) is moving ahead with its plan to install Arts IIIA computerized air traffic control (ATC) systems in 63 major U.S. airports despite criticism that the system still has not been perfected.

The agency has awarded a $43.3 million contract to Univac to upgrade the automated ATC systems at 34 airports, with equipment deliveries scheduled to begin in 1982.

Univac's previous contract to upgrade 29 airport installations called for equipment to be installed in those locations by January 1981 [CW, Feb. 18].

The first contract announcement came on the heels of a charge by Tampa, Fla., Professional Air Traffic Controllers Organization (Patco) members that their hybrid version of Arts-IIIA was "unsafe and unreliable" [CW, Feb. 11].

Basic on a modified Univac I/O Processor (IOP), Arts IIIA is designed to track both "primary" and "secondary" radar targets, as opposed to the commonly used Arts III system, which tracks only secondary targets.

Secondary targets are those equipped with electronic transponders carrying identification codes that indicate airline name, flight number, altitude and ground speed. Primary targets are smaller aircraft that are not equipped with transponders.

While FAA spokesmen have contended the Arts IIIAs going in around the country are "completely different" from the troublesome Tampa system, controllers already using Arts IIIA claim the system fails too often, displays overlapping targets on their radarscopes, sometimes fails to track airplanes and occasionally tracks airplanes that are not there.

The FAA has made improvements in the system since the initial phase-in, but some problems remain, according to Mike Coe, Patco facility representative at Atlanta International Airport.

"The computer people say the problem is with the radar, and the radar people say the problem is with the computer," Coe said last week.

Still plagued with mistracking and target overlapping, according to Coe, the system has improved in the area of recovery time from power fluctuations. "The 3-second recovery is a great improvement over the 27-second recovery, but sometimes it doesn't recover at all, and you don't know whether it will," Coe noted.

The shorter recovery time was made possible through installation of a battery power-conditioning system put in "three to five months ago" that guarantees the power will "come right back up" in the event of a failure, he explained.

IWPA Changes Name to Reflect Scope, Abilities

WASHINGTON, D.C. — At the fall meeting of the executive board of the International Word Processing Association, held here Oct. 19, the directors voted to expand the association's name to "International Information/Word Processing Association." The nonprofit professional group will use the new name starting June 1.

According to the directors, the expanded version of the name reflects a broadening of the agency's professional role. The board felt that the new name would better describe the abilities and scope of the association.

More information on the International (Information/) Word Processing Association can be obtained from the group at 1015 N. York Rd., Willow Grove, Pa. 19090.

Comnet to Probe Reagan's Impact on Industry

HOUSTON — The impact of the Reagan administration on the communications industry and Washington regulatory agencies will be a main topic of discussion at the Communications Networks '81 (Comnet) national conference and exposition when it is held here Jan. 13-15.

General Conference Chairman Richard E. Wiley, former chief of the Federal Communications Commission, has arranged a series of panels that will examine the new administration's ideas, changes in congressional makeup and struggle for power in relation to telecommunications policy.

Featured speakers examining how communications professionals will be affected will be Allen J. Krowe, president of IBM's Systems, Communication Division, who will discuss telecommunications profitability and resource employment; Robert LeBlanc, vice-chairman of Continental Telephone Co., who will talk about winners and losers in the communications marketplace and future trends; and Dr. C. Jackson Grayson Jr., chairman of the American Productivity Center, who will provide a perspective on telecommunications' influence on U.S. productivity.

The panels will include: "Legislative and Policy Framework for Telecommunications in the 1980s"; the "Second Computer and Communications Inquiry," examining the doctrine of competition; "What Is the Franchise for USPS and Public EM/MS Networks?," studying electronic mail; and "Policy, Regulatory and Privacy Problems," dealing with transaction communication issues.

Conference registration for the full three days costs $395; one day is $145. More information is available from The Conference Co., 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

Town Meeting Session To Cover Bell's Future

HOUSTON — The future of the Bell System, its users and competitors will be probed at the Communications Network '81 (Comnet) annual town meeting here on Jan. 13.

"The Future of AT&T: For Whom the Bell Tolls," will center on unregulated subsidiaries of the Bell System and their move into the marketplace, a central concern of the '80s, the organizers said.

Representing various positions will be William M. Ellinghaus, president and chief operating officer of AT&T; William McGowan, chairman of MCI Communications Corp.; Winston Himsworth, vice-president of Soloman Brothers, investment bankers; Ray Sanders, president of Tran Communications, a division of Amdahl Corp.; Ken Anderson, formerly a chief counsel on the Justice Department case against AT&T; Joseph Fogerty, commissioner of all Federal Communications Commission (FCC); George M. Shea. of National Data Corp., and the Association of Data Processing Service Organizations; Paul Henson, president of United Telecommunications, Inc.; and Walter Hinchman, consultant and former chief of the FCC Common Carrier Bureau.

Constant Corporate-Level Change Blamed for MIS Planning Chaos

TORONTO — "Constant changes taking place within corporate structures are often the reasons why information processing master plans become so chaotic," R.G. Taylor, president of Datacrown, Inc., told the recent Canadian Computer Conference here.

"Mergers, acquisitions and divestments often force DP departments to alter MIS systems, which tie up the staff and prohibit the development of new applications," Taylor explained.

Commenting on the topic of whether the DP profession will be able to meet the demands of the future, Taylor stated that the backlog of underdeveloped systems that has arisen because of computer cost-effectiveness must be rectified if users' needs are to be met.

"The DP industry must make a supreme effort within the next few years to alleviate the problems that now assail it if it is to realistically meet future demands," he stated. "Enormous strides have been made in the last few years in operating systems to give greater performance, reliability and security. Hardware now features things that were not always priority demands of users in the past."

Taylor pointed out that the "user-friendly" terminals of today will let managers handle their day-to-day operations through the desktop terminal.

"With the advent of distributed data processing and telecommunications culminating in a trend toward decentralization, DP departments will have more control over the purchasing of hardware in their organizations," he said.

He also noted that computer service companies have the ability to make major contributions to meeting the demand for more and better services because of their ability to stay abreast of the industry's state of the art.

The audience at the conference was generally in agreement with Taylor's opinion that the end user must become more involved and that a heightened level of cooperation is needed between senior management and DP professionals.

Usita Schedules Seminar On Deregulation Issues

WASHINGTON, D.C. — Three more Roundtable Seminars on "Deregulation and Competition in a Changing Telecommunications World" have been scheduled by the U.S. Independent Telephone Association (Usita), in cooperation with the Organization for the Protection and Advancement of Small Telephone Companies.

Sites include Atlanta on Jan. 7-8; Salt Lake City, Feb. 9-10; and Boston, Feb. 25-26.

Access charges, settlements and separations, deregulation and competition will be among the topics covered at the seminars.

The $150 registration fee is being charged to help defray costs for the nonprofit organizing sponsors. Additional information is available from Usita offices at Suite 1201, 1801 K. Street, N.W., Washington, D.C. 20006.

Efta Elects Top Officers

WASHINGTON, D.C. — Howard Mandelbaum, vice-president at Manufacturers Hanover Trust Co. in New York, and Robert Barone, vice-president and general manager of financial marketing at Diebold, Inc., were recently elected chairman and vice-chairman, respectively, of the Electronic Funds Transfer Association (Efta).

Mandelbaum, a charter member of the group, most recently served as its vice-chairman. He is responsible for retail EFT research and planning at his bank.

Barone, also a charter member, heads up the Automatic Banking Group in his organization.

The next public meeting of Efta members will be held in Chicago, Dec. 7-9. Further details can be obtained from Efta headquarters at Suite 502, 1029 Vermont Ave., N.W., Washington, D.C. 20005.

Calendar

Dec. 8-12, Boston — **Structured Programming: Design, Coding and Implementation Techniques.** Contact: American Management Associations, 135 W. 50 St., New York, N.Y. 10020.

Dec. 8-12, Los Angeles — **Strategies for Software Development.** Contact: Yourdon, Inc., Suite 3830, 1133 Avenue of the Americas, New York, N.Y. 10036.

Dec. 8-12, Ft. Lauderdale, Fla. — **How to Develop Long-Range Data Processing Plan.** Contact: Keston Associates, 11317 Old Club Road, Rockville, Md. 20852.

Dec. 8-12, San Francisco — **Structured Systems Analysis and Design.** Contact: Oberland Associates, 4036 N.E. Sandy, Portland, Ore. 97212.

Dec. 8-12, Washington, D.C. — **IMS/VS Data Base Design.** Contact: Data Base Management, Inc., 281 Hartford Tnpk., Vernon, Conn. 06066.

Dec. 9, Cambridge, Mass. — **Remotely Sensed Data: Management and Integration.** Contact: Harvard University, Laboratory Graphics, 48 Quincy St., Cambridge, Mass. 02138.

Dec. 9, San Francisco — **Computer-Aided Thinking for Financial Executives.** Contact: STSC, Inc., 11 Clearbrook Road, Elmsford, N.Y. 10523. Also being held Dec. 3 in Madrid and Dec. 11 in Los Angeles.

Dec. 9, Boston — **Automatic Control of Execution (ACE).** Contact: STSC, Inc., 11 Clearbrook Road, Elmsford, N.Y. 10523.

Dec. 9-10, Washington, D.C. — **National Data Systems Forum and Exhibit.** Contact: Transportation Data Coordinating Committee, 1101 17 St. N.W., Washington, D.C. 20036.

Dec. 9-11, Hartford, Conn. — **DL/1 Application Programming Workshop.** Contact: The Hartford Graduate Center, 275 Windsor St., Hartford, Conn. 06120.

Dec. 9-12, Anaheim, Calif. — **Voice Input/Output for Computer.** Contact: Integrated Computer Systems, 3304 Pico Blvd., Santa Monica, Calif. 90405.

Dec. 9-12, Boston — **Interactive Computer Graphics.** Contact: Integrated Computer Systems, 3304 Pico Blvd., Santa Monica, Calif. 90405.

Dec. 10-11, San Francisco — **Recovery/Restart.** Contact: On-Line Software International, 65 Rt. 4 E., River Edge, N.J. 07661.

Dec. 10-11, Gaithersburg, Md. — **Computer Networking Symposium**, sponsored by the Institute of Electrical and Electronics Engineers. Contact: Computer Networking, P.O. Box 639, Silver Spring, Md. 20901.

Dec. 10-12, New York — **DP Operations Today: Effective Scheduling and Console Operation.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 10-12, Singapore — **Telecom Conference and Exhibits.** Contact: John Sodolski, 2001 Eye St. N.W., Washington, D.C. 20006.

Dec. 10-12, Houston — **Leadership Skills for Office Supervisors.** Contact: American Management Associations, 135 W. 50 St., New York, N.Y. 10020. Also being held Dec. 17-19 in New York.

Dec. 10-12, Wellesley, Mass. — **Structured Programming Workshop.** Contact: Q.E.D. Information Sciences, Inc., 180 Linden St., Wellesley, Mass. 02181.

Dec. 10-12, Washington, D.C. — **Linear and Nonlinear Model Fitting.** Contact: The Institute for Professional Education, Suite 303, 1515 N. Court House Road, Arlington, VA 22201.

Dec. 10-12, Hartford, Conn. — **Audit and Control in the Data Base Environment.** Contact: RHY Consultants, Inc., P.O. Box 21026, St. Paul, Minn. 55121.

Dec. 10-12, Dallas — **Distributed Systems: Effective Approaches and Applications.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 10-12, Washington, D.C. — **Intershake Concepts.** Contact: Atlantic Research Corp., 5390 Cherokee Ave., Alexandria, Va. 22314.

Dec. 10-12, San Francisco — **Office Automation Systems.** Contact: The Institute for Professional Education, Suite 303, 1515 N. Court House Road, Arlington, Va. 22201.

Dec. 10-12, Washington, D.C. — **Microfilm Information Systems.** Contact: George Washington University, School of Engineering and Applied Science, Washington, D.C. 20052.

Dec. 10-12, New York — **Introduction to Data Communications.** Contact: Systems Technology Forum, 8901 Cotswold Drive, Burke, Va. 22015.

Dec. 10-12, San Diego — **DP Disaster Recovery Workshop.** Contact: EDP Security, Inc. 400-402 Totten Pond Road, Waltham, Mass. 02154.

Dec. 11-12, Washington, D.C. — **Technical and Policy Issues in Electrical Mail and Message Systems.** Contact: American Federation of Information Processing Societies, Inc., P.O. Box 9657, Arlington, Va. 22209.

Dec. 12, New York — **Word Processing.** Contact: The University of Albany, Draper 306, Albany, N.Y. 12222.

Dec. 12, Cambridge, Mass. — **Computer Mapping: Getting Started, Applications.** Contact: Harvard University, Laboratory for Computer Graphics, 48 Quincy St., Cambridge, Mass. 02138.

Dec. 12-15, Acapulco, Mexico — **International Congress on Applied Systems Research and Cybernetics,** sponsored by the Institute of Electrical and Electronics Engineers. Contact: George E. Lasker, School of Computer Science, University of Windsor, Windsor, Ont. M9B 3P4, Canada.

Dec. 15, New York — **Communications Choices for the 1980s — Hardware, Software and Services.** Contact: The New York City Chapter of the Association for Computing Machinery, P.O. Box 245, New York, N.Y. 10017.

Dec. 15-16, Washington, D.C. — **Increasing Manufacturing Productivity Conference.** Contact: American Institute of Aeronautics and Astronautics, P.O. Box 91295, Los Angeles, Calif. 90009.

Dec. 15-16, San Francisco — **Communications Technology Trends.** Contact: Systems Technology Forum, 8901 Cotswold Drive, Burke, Va. 22015.

Dec. 15-16, Boston — **Data Base Management, Administration, Control.** Contact: Battelle Seminars and Studies Program, P.O. Box C-5395, Seattle, Wash. 98105.

Dec. 15-17, New York — **Systems Analysis and Design: Concepts and Practice.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 15-17, Washington, D.C. — **Computers: Hardware and Software.** Contact: George Washington University, School of Engineering and Applied Science, Washington, D.C. 20052.

Dec. 15-17, Washington, D.C. — **Data Base Systems: A Comparative Analysis of General-Purpose Systems.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 15-17, New York — **Advanced Design-Traditional Networks.** Contact: Systems Technology Forum, 8901 Cotswold Drive, Burke, Va. 22015.

Dec. 16-18, Phoenix — **Auditing, Security and Controls.** Contact: Advanced Computer Techniques Corp., 222 N. Central Ave., Phoenix, Ariz. 85004.

Call for Papers

TWENTIETH ANNUAL TECHNICAL SYMPOSIUM OF THE ASSOCIATION FOR COMPUTING MACHINERY, College Park, Md., June 18, 1981.

Innovation is the main theme of this meeting, and relevant papers are being solicited with empirical, practical and theoretical slants.

Authors should submit five double-spaced (unpublished) manuscripts to the program vice-chairman, W.M. Osborne, by Jan. 13, to Room B265, Technology Building, National Bureau of Standards, Washington, D.C. 20234.

WORKSHOP ON SOFTWARE ENGINEERING STANDARDS APPLICATIONS, San Francisco, Aug. 18-20, 1981.

Papers that summarize the impact of or experience with the application of software engineering standards are being sought for presentation by the IEEE Computer Society. Suggested topics include the selling of standards; the drive to standards; process standardization vs. recommended practices and tradeoffs; unreliable standards; realistic standards; cost effectiveness; standards development and compilation; factors in standard selection and tailoring; the case against standards; and other relevant themes.

Five copies of each submission are requested and should include a 750-word summary along with the 3000-word paper. Proposals should be mailed by Jan. 26; and writers will be notified of acceptance by March 30. Authors are reminded to include address and phone numbers. Camera-ready copy is due back May 25.

Participation in this workshop is limited to the authors of accepted papers and guest speakers and panelists. All accepted papers will be published in the proceedings.

Proposals should be sent to E. Bersoff, CTEC, Inc., 7777 Leesburg Pike, Falls Church, Va. 22043.

AUTOFACT III CONFERENCE AND EXPOSITION, Detroit, Mich., Nov. 9-12, 1981.

The Society of Manufacturing Engineers (SME) has issued a call for papers for its Autofact III conference and exposition on the automated, integrated factory. The technology areas to be discussed include computer-aided design and graphics, computer-aided manufacturing, automated assembly, materials flow and inventory control, inspection and quality control, predictive maintenance, automatic controls and processes and robotics.

Persons wishing to submit papers should contact Kevin Miller at the Technical Activities Dept., SME, One SME Drive, P.O. Box 930, Dearborn, Mich. 48128.

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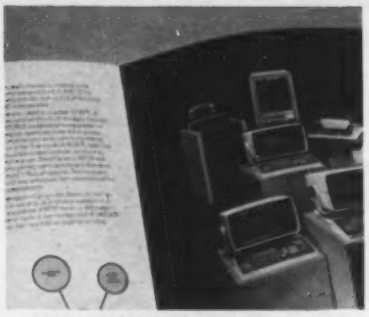

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EDITORIAL

What Course for the 3081?

IBM's recent announcement of the 3081 processor will leave users in a state of confusion until many details about the system are clarified.

For the past two years, a series of leaks from within IBM has given industry watchers a glimpse of the "H" series of mainframes which the IBMers claim will be IBM's main system in the 1980s.

However, the 3081 does not live up to many of the observers' expectations. But whether that means the expectations were off the mark or that IBM has more up its sleeve in the form of "mid-life kickers" for the system remains to be seen.

In any case, some directions are hinted at in IBM's release material.

For one thing, while the 3081 may be to H what the 370/155 was to the real 370 line, IBM will probably not have to outmode the 3081 system in order to add additional functions.

Users with long memories will remember that IBM announced the 370/155 and 370/165 with much fanfare in 1970. However, neither offered virtual storage capability, which was to be a hallmark of the 370 line. Within two years — and the announcement of the 370/148 and 370/158 — the systems were completely outmoded and a rather expensive piece of hardware — a Dynamic Address Translation (DAT) box — had to be added to make the 155 and 165 act like real 370s.

In many ways, the 3081 is like those early 370s — many more functions will be added over the life of the system, but probably without the disruption associated with the early 370s. Apparently IBM will be able to do this through a combination of microcode and changes to software, particularly operating system software.

"The 3081 contains multiple, distributed control stores which interact asynchronously, permitting functional changes with minimal hardware impact," IBM said in a description of the system issued to the press and users.

The use of control storage — [illegible]se for microcode — will permit the firm to add functions to the 3081 without completely outmoding the processors themselves.

In addition, IBM has put a lot of capability into the channels of the 3081, which can handle many paging functions that formerly had to be handled by the central processors.

By putting a large amount of computing power in the channels, the firm should be able to add functions such as back-end data base processing or other specialized processors without having to change the central processor configuration.

So while users should be somewhat leary of purchasing a 3081 — and should ask for some assurances from IBM that the firm does not plan to obsolete the system within a year or two — the system may not turn out to be the turkey the 370/155 and 165 became.

DATA PAST

Five Years Ago
Dec. 3, 1975

NEW YORK — Loopholes that facilitate DP-aided fraud existed "in all business systems," either by design or oversight, according to Leonard I. Krauss, manager of Ernst and Ernst's Management Consulting Services. Krauss told attendees at the Second Annual Computer Security Conference Workshop here that managers should "have a formalized approach" to fraud analysis.

— — —

LOS ANGELES — A 42-year-old DP executive, accused of stealing computer time and using someone else's password to gain access to the system, was arraigned in municipal court here. Marvin H. Maki, who worked for Manufacturing Data Systems, Inc. (MDSI), allegedly used information learned as an MDSI employee to gain access to that firm's computer.

Eight Years Ago
Nov. 29, 1972

DENVER — The Colorado Supreme Court barred the compilation of arrest records on persons who had not been convicted of crimes. The move made it illegal for police agencies to store or transmit criminal history information or rap sheets on persons arrested for criminal acts, but never convicted.

LETTERS

Enough Said

"Robotics Advances Aimed at Assembly Lines" [CW, Nov. 3] was very interesting. But I am forced to make one comment: In response to William E. Jarett's statement that there is only *one* limit to robots, namely us, I am wondering if he has ever encountered that American phenomenon — the union. Enough said about only one limit.

James Hoffner

Minneapolis, Minn.

Hung Up About Age

I was appalled by Larry Long's answer to the 57-year-old programmer with 24 years' experience who could not get a job [CW, Nov. 3]. I felt the answer was misleading and, most significantly, demonstrated a lack of sensitivity toward a serious problem in business.

The defense offered for the discriminating personnel managers was that by hiring an older person, they were exposing themselves to future age discrimination suits!

By the same logic, it would be unwise to hire any blacks, females or other minorities.

Long's reference to the "paradox of government intervention surfacing its ugly head" was a cop-out and a cheap shot.

Agism, racism, sexism or any other form of bigotry, when introduced into the personnel management process, repudiates the classical free enterprise theory that each individual would be reimbursed for what he is worth, without regard to irrelevant considerations.

Discriminating personnel practices are economically unsound for the above reason, socially irresponsible because in the aggregate they create an alienated and underutilized caste in our society and morally evil because of the psychic damage done to the individual.

It is conventional wisdom to characterize government bureaucracy as stupid and incompetent and business managers as all-wise and super-efficient.

Long's analysis of this particular situation reinforces the thesis that business gets the regulation it deserves.

If the firms involved in the cases cited have pension plans so poorly constructed that they could not afford to carry an older new hire, then they have an inherent agist bias and should be revised to permit the waiver of pension benefits or to base the pension on length of service, which could be done without running afoul of discrimination laws.

[Name Withheld by Request]

Action for Afghans

I read with interest the Oct. 20 article "DPers Contribute Big to Afghan Aid Fund." I believe Don Weidenweber's view that DPers have a strong sense of world affairs is true. We are conscious that we are shaping the future as no other industry is and wish these profound changes to work for the benefit of all mankind.

The idea of computers assisting the outrageous invasion and destruction of Afghanistan is sobering. As I become more aware of the immediate humanistic issues challenging the maturity of our profession, the larger issues take clearer shape. Is it possible to sell our achievements to the Soviets without facilitating acts of this kind? Some things just should not be automated.

These thoughts are part of my deep feeling of compassion for the courageous Afghans defending their country against awesome odds. I encourage all my fellow DPers to commit to some form of action in confronting this issue. Supporting American Aid for Afghans seems an ideal way.

Robin H. Shaylor

Portland Ore.

SOCIOLOGY OF COMPUTING/Robert L. Glass

Management Enters the Garden of Eden

Once upon a time, when coding was done in binary and the console "halt" button was considered a useful device, there arose in the land a small band of iconoclasts who spoke only to computers.

These people, clad in shirtsleeves, faded dungarees and loafers, slaved happily hour after hour over a hot console, making automated magic emerge from the giant vacuum tubes and playing the toggle switches like master musicians. Nothing gave them more pleasure than to elicit good responses from the flashing-lighted, tape-twirling seductress that inhaled all of their punched cards and switch settings and responded coyly with dubious logic and faulty checksums before finally sanctifying their numbers with the holiness of her awkwardly stylized printer.

A name was given to these iconoclasts; they were called "Programmers," and their creations were called "Programs," and the object of their love/hate relationship was called a "Computer." And as word of the Programmers' magic achievements spread throughout the land, a romanticism grew about their activities, and an awe grew about their results, and their numbers increased.

Before the first payroll program ever existed, these dedicated weavers spun tiny bits into big bucks. Before the first computer science course was taught, these earnest learners had mastered the intricacies of multilingual communication with inanimate devices. And before the first programmer manager existed, these technologists were sincere, dedicated and responsible workers whose only concern was doing a job well.

But into this Eden slithered a snake bearing beguiling apples labeled "Success." The responsible, multilingual Programmers found more and more of their time spent manipulating the big bucks, and less and less the tiny bits. And this did not please them. The big bucks, they felt, were a pleasant and necessary nuisance, a digression from Eden. The technology, the infinite twiddlings, were the goal. Pleasure derived from the computer, not from the bucks.

Tempting Fruits

The fruits of Success tempted the Programmers, and soon they bit into the shiniest and brightest of the lot, one with the extra label "Management." With Management on their team, they reasoned, they could spend less time on the bucks and more on the bits. They would delegate the uninteresting, largely trivial task of money management and free themselves to return to their technology. After all, wasn't that what Programming was all about?

And so they did. The Programmers hired a meek, eyeshade-wearing, stool-sitting accountant to track their big buck problems with his quill pen and inkstand. "Bother us not," they said to him, "unless disaster is imminent.

"Manage our money," they said to him. Then they added, parenthetically, "But don't manage us." And they went back, happily, to their collective consoles.

But as the accountant sat on the tall stool day after day, making the pennies balance under each horizontal line he drew, he perceived that not only was there more to life than horizontal lines and numbers, but he had it all within his grasp. The bucks the Programmers had attracted for their wares were indeed Big Bucks, and the accountant began to realize that he had sole control over all that money.

Accountant's About-Face

There are many possible interpretations of "The meek shall inherit the earth." The last one the Programmers would have expected was that their mild-mannered accountant would turn

(Continued on Page 36)

SOFTLINE/Werner L. Frank

Software Maintenance Here to Stay

Software maintenance is surely the most talked about problem after the issues of implementation are set aside. And maintenance and implementation are key topics today since these two efforts comprise the lagging software productivity dilemma.

Industry observers report that the maintenance portion of the software life cycle can consume more than three to five times the effort initially expended for the basic implementation itself. Others report that up to 70% of the ongoing efforts in programming departments are occupied with modifying earlier written software.

The intensity of this effort can also be noted by the following observations:

(1) Programs grow over time, doubling or even tripling in lines of code over the life cycle, from the initial development size.

(2) Individual instructions are replaced rapidly so that the half life of a written piece of code is only a few years.

(3) Program maintenance is expensive since the practitioners have limited tools and incentives for doing a cost-effective job.

All this leads to the seeming conclusion that maintenance is a costly nuisance. It is also the iceberg that is bound to scuttle budgeteers who fail to incorporate sufficient resources into their tables of organization as new applications make their appearances. That is to say, for every programmer who develops new software, the organization must anticipate adding two-thirds of a maintenance person to the staff annually just to stay in place, if the software has an optimistic life cycle of eight years.

Containing the Monster

Thus we have the basis for motivating the containment of this maintenance monstrosity. Suggestions come from four directions:

(1) Do a better initial design job to eliminate or at least minimize the ultimate defect-removal process during systems operation.

(2) Do a better programming and documentation job through structured methods and careful checks in order to minimize operational bugs or to facilitate their fix.

(3) Use programming development tools and aids that simplify the statement of problems and to the extent possible employ previously generated, checked-out code.

(4) Use packaged software that is centrally maintained for many users.

But we do ourselves a disservice in thinking that software maintenance is necessarily bad and avoidable. Unfortunately, we are too prone to associate the word with "repair" and connect this function with the use of the term in a hardware context.

After all, hardware maintenance is what we really understand and can gracefully expect and accept, since all machines wear out over time. On the other hand, weakness in software seems to be hard to acknowledge, since it speaks to the inadequacy of the individual creator — who should be in control of the situation.

Important Differences

But hardware and software maintenance are different! As so ably pointed out by my colleague, Fred Braddock, the objective in coping with hardware maintenance is to achieve consistency from the point of view of its operability. But in the case of software, what we call maintenance is, for the most part, a concern with chasing change.

In other words, in hardware maintenance we wish to maintain efficient machine performance by avoiding breakdowns and causes of errors. Hence, we are willing to even cease operations from time to time and pay for preventive maintenance.

In the case of software maintenance, much is concerned with correcting de-

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READER COMMENTARY/Domenick Flotta

A Zip Code Solution

As team leader and supervisor of maintenance programming in our division, I have been concerned with the possibility of converting to a nine-digit Zip Code. This has prompted me to decide what could be done about it using minimal factors supplied by the U.S. Postal Service (USPS) in the form of a conversion tape. Cobol is the language used in our division.

First let me point out that our existing files containing Zip Code data will not pose a problem insofar as space is concerned. The nine-digit code can simply be packed into the present five-position field. The exceptions are those fields that may have the current five digits packed into three positions.

The old formula:

$$\frac{\text{field size}}{2} + 1 = \text{packed size}$$

indicates that nine unpacked digits fit nicely into five packed bytes of storage. Thus size is not much of a factor in our conversion on storage media. However, display media and printed documents or labels will need complete revisions to allow the edited nine-digit code to be inserted.

Putting aside the size conversions and getting into the actual Zip Code conversion, let us assume a tape is furnished by the USPS. This means we will have two input files, the USPS file and our own, to have Zip Code data converted. I am assuming that the USPS tape would consist of records that would be used as table entries in the following format: The record minimum size would possibly be 39 positions.

- Positions 1 to 5 — current Zip Code.
- Positions 6 to 35 — first line of address.
- Positions 36 to 39 — four-digit extension.

Taking the above into consideration, we can see that the furnished tape records would have to be stored in a table or tables depending on the size of the file. After this, the file would then be processed by extracting the current Zip and first line of address to build a search key for matching against the table.

On a match, the four-digit extension would be moved to a work field preceded by the current Zip Code. This field is redefined as picture 9 (9). The redefined field is then moved to the output Zip Code definition: picture 9 (9) Comp-3 (packed decimal).

In order for a conversion of this type to work, the following must be true:

- The supplied first lines of address must furnish a match.
- To match they must come in various formats including all possible abbreviations and various characters used in addresses.
- If other factors are used, they would have to follow suit unless the USPS has new unknowns.

Flotta is with the Pennsylvania Bureau of Health Data Systems located in Harrisburg, Pa.

LETTERS

Perhaps a White Robe?

I teach a graduate-level MIS course at night at a local military base. At the conclusion of the last term, I was given copies of the student evaluations of the course. One student replied, "I expected more variety in MIS and was disappointed to find it only the process of logic."

Obviously I was not living up to the reputation of the computer "type." Next term, I am contemplating renaming the course "Management Information Magic." I will be sure to include whistles, bells and flashing lights. Perhaps I should wear a white robe.

William J. Maisey

Lackey, Va.

Likely Pitfall

"Rookie Users Warned of Micro Shortcomings" [CW, Nov. 10] I believe gave the wrong warning to the right people. The most likely pitfall for the first-time user is speaking to unqualified people who sell micros.

Micros can and do serve a very useful purpose to small businessmen. They can provide management information that is valuable.

The real problem is that many sellers of microcomputers have not the slightest idea of the *results* the businessman needs to run his business. That is evident in the mortality rate of such sellers as computer stores.

The best interests of the computer industry, users and sellers of micros will not be served until salespeople are taught accounting and management information requirements. Prospective users are waiting eagerly to talk to someone who understands their needs.

Computers are no longer wonders, they are tools. The buyer should not be expected to "reinvent the wheel" by diagnosing his own requirements and exposing himself to salesmen whose only claim is a high degree of technical knowledge, not results.

B.R. Mills

Fort Myers, Fla.

Not Energy-Related

David F. Stevens' article, "The Menace of Micros" [CW, Nov. 3], presented some interesting speculation on the future, however it did not appear to be related in any way to energy or the problems of energy in the future. I point this out because the Department of Energy paid for this research and probably expected a finished product that at least mentioned the word "energy" once.

The closest Stevens ever got to the subject of energy was mention of brain power and brain cooling factories (unless we assume Dr. Frankenstein was mentioned as an example of the first solar-powered toy).

While the few talented inventors in America scramble for R&D funding from the Department of Energy, we find that the money is being wasted on factless, hypothetical wanderings which present no immediate or long-term solutions. The public, and the readership, would be better served if *Computerworld* reported solutions instead of suppositions.

Wayne J. Socha

Phoenix, Ariz.

Simplistic Analysis

Dr. Robert Parslow's contention that the quality of life is declining because of computers [CW, Nov. 3] is like saying that air pollution is a result of the discovery of electricity. Parslow reminds me of a local police chief that recently recommended that our park benches be removed because drunks sleep them. Such simplistic analyses of what are symptoms and what are problems lead to erroneous "solutions."

There is no doubt that society needs to be made aware of possible applications and abuses of computer technology. We must actively manage the use of these tools. But don't let us blame Ben Franklin the next time we handle a frayed wire and get an electric shock.

James O. Baldwin

Philadelphia, Pa.

Right On!

When I read the report of Dr. Richard Hamming's talk ["Programmers Slammed for Not Keeping Up," CW, Oct. 20], I thought, "Right on!" I certainly never expected to see letters of disagreement.

My degree is in aeronautical engineering; I got into programming almost by accident and stayed in because I liked it. Both as an engineer and as a programmer, I have taken the position that it is my responsibility, not my employer's, to study my chosen field after work as well as during work.

Of course, my employer has helped me do so, to some extent, and I would prefer it do more. But Mr. McCarthy, ["Implausible Position," CW, Nov. 10] had it backwards. To put it correctly, "Not until programmers take the time and money to keep up with technolog-

Management Enters the Garden of Eden

(Continued from Page 35)

into a Supermanager before their very eyes. But turn he did.

Gradually, as in slowly but surely, the accountant used his knowledge of the financial aspects of the Programmers' tasks to gain control of those tasks. And all too soon, instead of the accountant doing the Programmers' bidding, the situation was reversed. Supermanager was behind the man behind the console, with his hands in his pockets.

It is time to digress from our tale. What is happening here is not just a story about computing. What is happening is a more historically significant saga, clad in computing clothing. What is happening here is a fable that night be called "The Technologist and the Administrator."

Try reading the story on another level. For "Programmer," read "inventor of the wheel." What we see emerging from the caves of early technology is the origin of management, not as the knight in shining armor saving the world from the mad scientist (mixed metaphorically speaking), but as the Fagan of technology, grasping the reins and veins of financial control from the innocent and unsuspecting intelligentsia. If technology's earliest watchword was "Think," management's, this fable is saying, may have been "Scheme."

But back to our story. The nature of the Programmers' task began to change. With the advent of Management, Management Control also came to pass. And, far from freeing himself from the nontechnical nuisances of his life, the Programmer now had to satisfy a seeming infinity of peripheral tasks — progress reporting, design reviewing, schedule building, visual aids drawing, flowcharting and other offenses to the intellect.

Worse yet, an apathy settled on the land. The once-responsible Programmers, proud of the quality of their product, no longer cared very much. They were scored more for the quality of their flipcharts than for the quality of their programs.

Personality was rewarded more than productivity. Coding was a neglected art, as Management, firmly in the saddle, rewarded management-mimicking activities.

And with the decline in responsibility, Management, aware of the problem but not aware of the solution, instituted still tighter controls, still more apathy-producing peripheral tasks, because, they kept insisting, "Management can solve this problem" which Management had, in fact, created!

The Programmers' world, in short, had turned topsy-turvy. What had begun as the delegation of trivia had instead become the victory of trivia.

ical advancement can they expect to be paid in the professional salary range of $35,000 to 45,000."

Doug Pearson

Mountain View, Calif.

Flip Flop

Have you ever run into a situation where you want to set and reset a flag alternately when you pass through a routine?

An example of this would be if you have a special button on a keyboard, which you push once to change the mode and push again to reset the mode.

The standard approach to this task could be to reserve a mode flag and, upon detecting this special key, test to see if the mode flag is set. Then if it is not set, set it — or, if it is set, reset it.

```
Special Key:
   LD    A, (FLAG)
   CP    01
   JP    Z, SET IT
Reset it:
   LD    A, 0
   LD    (FLAG), A
   Ret
Set it:
   LD    A, 01
   LD    (FLAG), A
   Ret
```

Instead, why not use the flip flop; "exclusive OR" it.

```
Special Key:
   LD    A, (FLAG)
   XOR   01
   LD    (FLAG), A
   Ret
```

This subroutine does exactly what the first did, but it takes nine bytes instead of 20 bytes. Notice that the "XOR 01" says if this bit (0) is set, it will be reset by the XOR. Or if it is already reset, it will be set by the same XOR.

Therefore, every time you pass through this subroutine, the flag changes state: a flip flop.

Flip flopping will work on every bit specified in the XOR statement and only those bits. So if other bits were used for other modes, each can be handled separately.

Further, if you had the need to alternate between the numeric values, this would work in the same way. For example, to alternate between "D6" and "20" calculate what number when exclusive ORed with "D6" would result in "20" and you have it.

```
ALTERNATE:
   LD    A, (VALUE)     ; if value = D6 it
                          will change to 20
   XOR   F6             ; if value = 20 it
                          will change to D6
   LD    (VALUE), A
   Ret
```

Ted Di Salvo

Elmwood, Park, N.J.

Shallow Software View

"Programmers Slammed for Not Keeping Up," based on Richard Hamming's remarks at the 10th annual conference of the Association of Computer Programmers and Analysts, was an accurate description of the situation in the programming world.

Unfortunately, in his analysis, Hamming, a professed expert on the subject, displayed an amazingly shallow and naive view of the programming environment. As he stated, programmers do not keep up with the state of the art of their profession. This situation also exists to a very great degree in hardware engineering as well.

The point Hamming totally missed is that the incentive for keeping up does not really exist in most software and hardware development organizations. The pressures and schedules to deliver today's products rarely leave time for what management considers software symposiums and training "boondoggles." Though there is generally managerial support for technical training or improvemant, it is almost always lip service or "that's fine if we can get it free." Any real pressure to acquire state-of-the-art expertise must be self-generated.

Hamming was quick to beat his breast and stated, "I put myself on the firing line regularly and let people take shots at me." This is garbage. It is his business to pursue such positions or his consultant fees would dry up very rapidly. In fact, the programmer on the firing line very rarely has the leisure, opportunity or incentive for such pursuits. Even if he acquired the capability, his management would make it very difficult for him to express or implement state-of-the-art technology in the ongoing business environment.

Hamming totally missed the fact that the employer and software management are equally responsible for the technological gap which has developed in the programming world. Rather than promote and actively support the concept of constant training and upgrading of their organization, they have taken the myopic view that it is easier to pay headhunters their exorbitant fees and cause salary compression by ignoring the best solution.

Yes indeed, programmers should be admonished for not keeping up, but so should the introverted management that neither promotes nor provides any incentive to those who would pursue the leading edge of the technology.

S.L. Showah

Billerica, Mass.

LETTERS

Computerworld welcomes comments from its readers. Letters should be addressed to Editor, *Computerworld*, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

Software Maintenance: It's With Us for Good

(Continued from Page 35)
fects in design or error in logic of the code, but for the most part the effort is usually expended in adding capacity or capability to existing functions. Over time, software must reflect changes in user needs and the operating environment. That is why it is *software* and not *hardware* to begin with. And therefore, there is a certain inevitableness about the software maintenance aspect that will continue to be with us because we live with change.

Better Records

How then do we cope with software maintenance? First of all, we should recognize it for what it is, organize and handle it. There is a subtle and important difference between the correcting or repair process and the production of enhancements and reconciling older features to new environments. Understanding of the maintenance process begins with better accounting records reflecting these differences.

Initial budgeting and subsequent actual cost feedback of expenditure in maintenance to the user by these breakdowns will soon get the message across as to where the real problems lie. If too much is expended in the repair column, remedial action can be taken with the analysts and programming staff as it relates to the implementation process. If a large effort is ultimately identified with respect to basic redesign of the application, the user himself must accept responsibility for having understood his problem in the first place.

On the other hand, if the bulk of the effort is in response to change, the user will better appreciate the nature of software as distinct from hardware. Such changes, functional or environmental, should be at the discretion of the source of the application's financial support. The change should be entertained only if there is a cost benefit to be achieved.

Aggressive Aspect

But maintenance is not only a reactionary process. There are also aggressive steps that can be taken to further the performance of a system:

(a) Streamlining ongoing procedures.

(b) Adding more safeguards in areas of security as well as data validation.

(c) Enhancing machine performance via software tuning.

(d) Checking for system and processing integrity of the data as well as the application logic.

In this broader context, maintenance really becomes a specific and continuing software life cycle function that must be anticipated and funded. This ultimate requirement must be imposed during the initial system design so that the following will be accommodated:

(1) The application will be described for varying performance parameters relating to numbers of users, size of buffers and tables, number of transactions and size of files.

(2) The application logic will be modular and data independent, parameterized as much as possible.

(3) The application will have standard interfaces to systems software and will have defined entry and exit points.

In placing these limits and restrictions, we have generalized the software so that it can operate with broader scope and in varying circumstances.

It stands to reason that giving up very specific and custom-built requirements in software also helps the maintenance problem.

LETTERS

One Happy Note

"Computers are job killers," said Calvin Gotlieb [CW, Oct. 13]. That is probably true. And it is probably true of every technology there ever was. Look at what the car did for the harness maker.

Nevertheless, I stand by the wisdom learned on my father's knee: jobs don't disappear — they change. That is why I constantly test the winds for change in my own field. I am not deaf to the prophets who predict a decreasing need for software people like myself.

However, in fairness to you whose jobs are threatened by computers, I did have one panicky moment when Gotlieb suggested limiting the growth of computer applications. I was looking up the number for Dial-a-Union when I caught myself and decided to stick to my original game plan.

There is a happy note for all of us who stand to lose our jobs to new computer technology. Gotlieb suggested we have employment impact statements (like environmental impact studies) before a new computer system is approved. The jobs created by the bureaucracy to administer that piece of legislation should take up any slack.

Jacques C. Kaufman
Binghamton, N.H.

Pays Off in the End

Calvin Gotlieb's comments are true when you speak of the jobs lost at the production-worker level, but he does not take into consideration the jobs added in other production facilities for manufacturing the computers or the jobs added in the area of sales and support to the new technology.

The problem is not lost jobs, but the upgrading and retraining of the production worker to function in a more sophisticated environment. Actually, we have been experiencing this "lost jobs" phenomenon since the 1950s. Then we were replacing office workers doing pencil jobs and upgrading them to data entry people. The DP equipment then gave management more information with fewer people.

It very often turned out that despite the vendor's sales pitch, more people were required than before, but with expanding business, more information could be processed than before.

I remember making a study for a former employer in 1963 regarding order entry, shipping papers, billing, accounts receivable and inventory control, and we determined that it would require 200 more clerks to handle the same information and give the customer the same service.

Essentially, the computer reduces the direct labor of the company by indirect labor and depreciation, but new industries have been born to supply the equipment and supplies for this new environment.

The loss of jobs during the industrial revolution occurred at an unskilled level by replacing these jobs with others at a more skilled level. In addition, these changes allowed the industrialized nations to produce more at a lower cost while increasing the standard of living for all.

There is always a period of adjustment, but improved technology pays off for all mankind in the long run.

H. Lawrence Abbott
Wyomissing, Pa.

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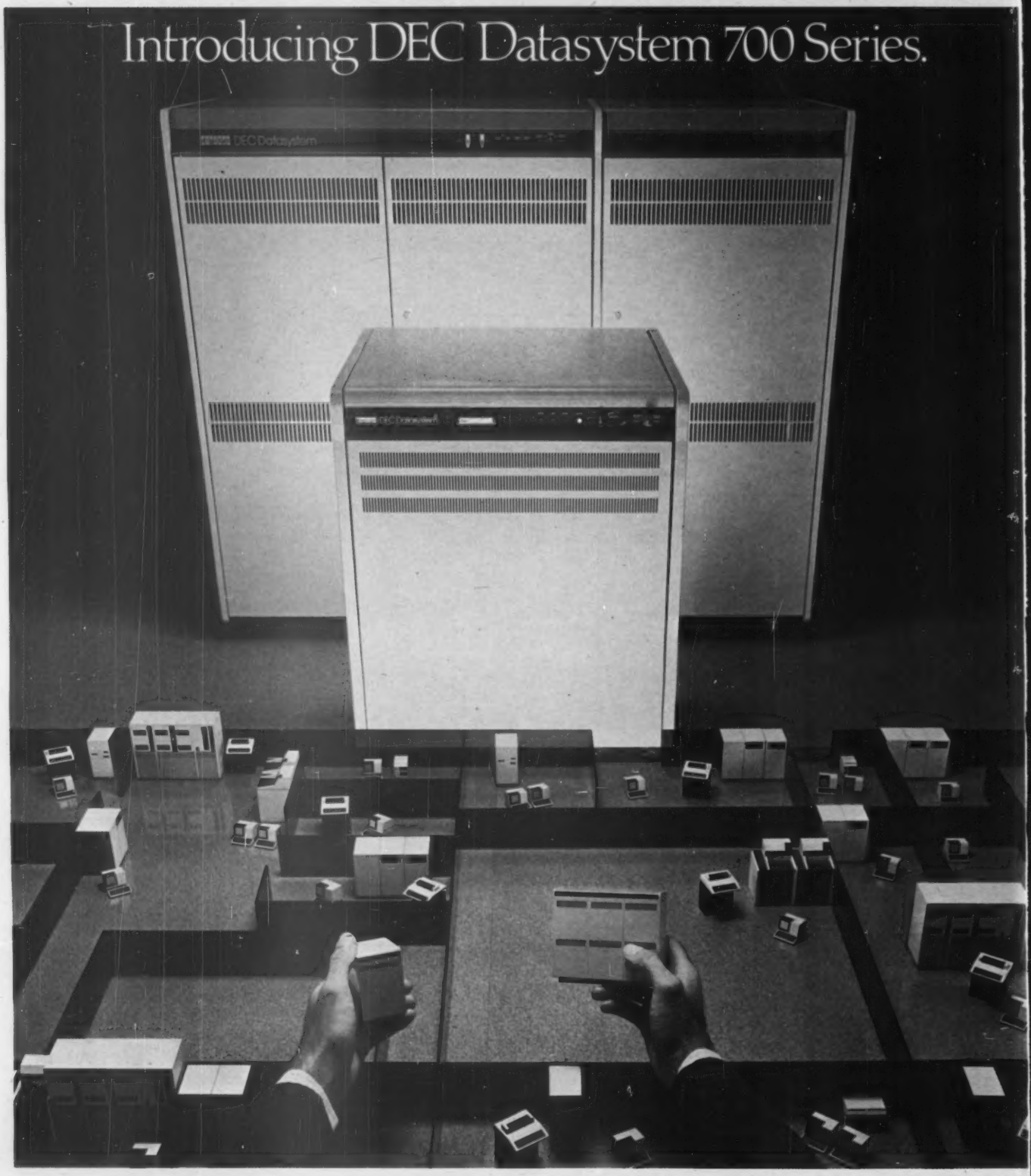

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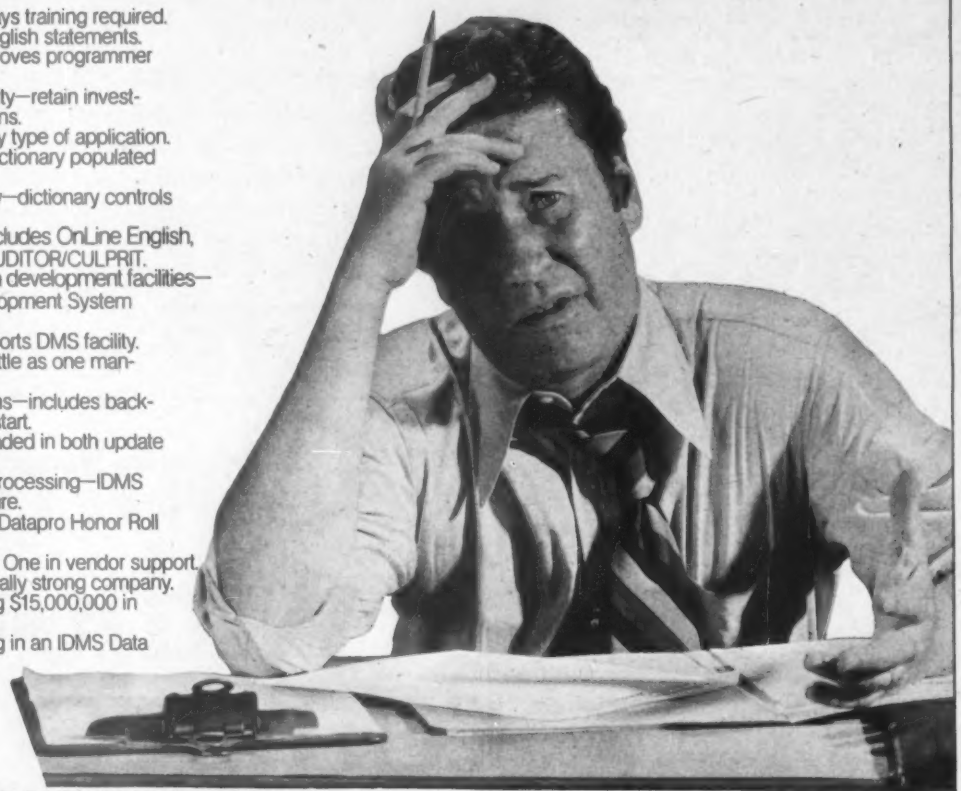

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How Does a DBA Cope?

By David A. Herb
Special to CW

How does a data base administrator (DBA) cope with constantly changing informational needs? Can the newly appointed DBA accomplish long-term objectives while providing some immediate benefits to the corporation? These are questions that a DBA is almost certain to face when establishing his function.

In 1978, State Accident Insurance Fund (Saif) recognized the need for a data base management system (DBMS) in order to effectively respond to changing system requirements. At that point, Saif was a state agency providing workmen's compensation insurance. Since the organization was competing with private insurance companies, the ability to react quickly to changes in the marketplace was essential.

This description of a DBA's responsibilities is provided by a person who copes with them on a day-to-day basis — the DBA for the State Accident Insurance Fund in Salem, Ore.

In addition, frequent requests for information were being received from the Oregon state legislature. These requests were generally unstructured and nonrepetitive. Conventional file structures made it difficult, if not impossible, to write the programs necessary to generate the reports for the legislature within an acceptable time frame. These same delays made Saif management reluctant to propose changes to the Workmen's Compensation law which could be backed up by firm statistics.

DBA Position Defined

Based upon these needs and an operating environment that included IBM 370 hardware and CICS, Saif installed Intel Corp.'s System 2000 DBMS. It was also necessary to create a data dictionary directory (DDD) in order to store the vali-

(Continued on Page 44)

Between Subsystems

IMS/VS Update Allows Data Sharing

By Rita Shoor
CW Staff

WHITE PLAINS, N.Y. — IBM recently introduced Version 1 Release 2 of its IMS/VS software with strong emphasis on a data-sharing facility.

This facility will allow multiple IMS/VS subsystems to share data with each other while batch systems are retrieving data, the vendor explained. Data may also be shared between one updating batch subsystem and other retrieve subsystems, and large installations will be able to use multiple processors with shared direct-access storage to access the same data base with integrity.

Data-sharing capability is being offered at the data base level and the block level. Block-level sharing was defined by the vendor as "locking at physical block for Isam/Osam data bases and at a control interval for Vsam data bases," while data base sharing is "locking at the IMS/VS DL/1 data base level whether Isam/-Osam or Vsam."

In less technical terminology, block-level sharing offers one user exclusive use of a particular block of data while leaving other users access to the rest of the data base. At the data base level, one user would have exclusive use of the entire data base.

A maximum of two processors can be configured to participate in block-level sharing, and the maximum number of processors which can participate at the data base level is limited by the number of paths to the direct access devices that store the data to be shared, IBM said.

Support for IBM's 3375 disk and the speed matching buffer for the large-capacity 3380 device is also available with Release 2.

DBRC Prerequisite

IBM's Data Base Recovery Control (DBRC) feature, which is enhanced in Release 2, is a prerequisite for the data sharing capability.

This may cause potential data-sharing users to view the capability with some hesitation. At least one data base specialist indicated that he received a generally unfavorable impression of the earlier DBRC release through the DP grapevine. While admitting that he did not have direct hands-on experience with DBRC at his installation, he indicated that "we'd look at the data sharing very carefully because of [possible] previous problems with DBRC."

The enhanced DBRC also interfaces to six additional IMS/VS utilities and provides the ability to invoke DBRC control statements as IMS/VS commands. IBM said the DBRC installation macro has been improved, and the number of interface points used by the IMS/VS control program for storing information required during recovery has been expanded.

Extended printer support for both system network architecture (SNA) and non-SNA environments is included with the data communication (DC) feature in Release 2. Printer sharing is also provided for users with multiple systems sharing a common network of 3270 display and printers between IMS/VS and other systems.

The DC feature extends the use of the local storage option

(Continued on Page 44)

We Want to Know

Information systems managers are faced several times in their careers with deciding whether purchasing an applications software package is more beneficial to the company than developing the same application in-house.

Computerworld will be publishing a "Special Report on Applications Packages" in January. If you are one of those who have opted to buy software, we want to hear about your experience with the package: How much tailoring had to be done by your programmers? Did you encounter problems interfacing the applications package with your operating system or data base management system? Would you make the same decision again?

We also want to know the costs and benefits tied to the package you chose. Send your experiences by Dec. 12 in a typed, double-spaced manuscript no longer than five or six pages to Rita Shoor, Senior Editor/-Software and Services, *Computerworld*, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

DBL Substitutes for Dibol On PDP-11-Based Systems

CARMICHAEL, Calif. — Digital Information Systems Corp. (Disc) has announced Release 2.0 of Data/-Business Language (DBL), reportedly usable on any Digital Equipment Corp. PDP-11-based computer system.

DBL 2.0 is said to compile and execute programs written in either DBL 1.3 or DEC's Dibol-11, as well as offer additional capabilities to those languages.

For the programmer, the release is said to offer extensions that reduce the effort in originally creating programs. For the software manager, the release reportedly enables programs to be more easily maintained.

Besides some structured concepts in the release, also featured are an INCLUDE facility, "global" storage definition, fixed-length binary I/O and enhanced error-handling facilities, according to the vendor.

Prices vary according to the operating system used: RT-11 costs $1,100; TSX, $1,500; RSTS, $4,200; and RSX-11M, $4,200. Disc is located at 6247 Fair Oaks Blvd., Carmichael, Calif. 95608.

Fortran Debug Aid Released by Pilkerton

ANAHEIM, Calif. — Pilkerton International has developed a Fortran debugging aid that it said eliminates the need to look at Abend dumps.

The package gives programmers information in a form that relates directly to the Fortran program, such as the current value of variables in the correct decimal format, the vendor said.

The package costs $190 and is available for a 21-day free trial.

Pilkerton International can be reached through P.O. Box 6372, Anaheim, Calif.

'Cosap' Runs Stat Functions For Discrete, Continuous Data

APPLETON, Wis. — Lawrence University has announced Version 2B of its Conversationally Oriented Statistical Analysis Package (Cosap) for Digital Equipment Corp. PDP-11s operating under RSTS/E, said to perform manipulations and statistical analyses of discrete and continuous data.

Version 2B, written in Basic-Plus, was designed for use on PDP-11s in an 8W user area operating under Version 7.0 of RSTS/E.

Documentation includes a system manager's guide and a user's guide.

One-time license charges are as follows: Time-sharing service bureau, negotiated rates; commercial organization, $5,000 plus $2,500 per additional system; nonprofit organization, $2,000 plus $1,000 per additional system; and educational institution, $1,000 plus $500 per additional system. One-time fees include one set of documentation and any updates or revisions issued within the first 12 months.

More information is available from Computer Center Publications, Lawrence University, Box 599, Appleton, Wis. 54912, Attn: Cosap V2B Order Processing.

DBA Functions Defined

(Continued from Page 43)

dation rules applied to each element within the data base. Given these basic tools, Saif defined the DBA position.

The DBA has eight major functions. The object of each is to organize and control information so access to information will be improved.

- *Definition and Organization:* Defining the contents and structure of a data base is an iterative process. At Saif, this involved examining multiple files and combining, eliminating and renaming elements. These elements were organized into a structure modeled after insurance claim processing. The hierarchical framework not only eliminated element redundancy, but also made a structure which could be expanded whenever necessary.
- *Data Integrity:* Since claims processing requires an on-line update to the data base, a backup copy is taken each night. If the data base is damaged during on-line processing, it is restored by reloading the backup copy and applying an update log.

It is also necessary to validate data as it is entered and changed on the data base in order to ensure data integrity.

- *Performance:* A critical part of the DBA's role is tied to making the DBMS perform effectively. At Saif, that means an on-line update environment with rapid response to on-line transactions and some ad hoc query ability. The first task was to define an acceptable performance level and a measurement methodology. Tuning consisted of selecting DBMS execution parameters, determing which elements should become segment keys and reviewing program commands.
- *Documentation:* Principal items to document are data base definitions and data structures. The structures can be represented by a hierarchical chart, and data base definitions are stored in the DDD.
- *Standards:* Providing standards is necessary for an effective data base environment. Standards should define the design, program development and operational aspects of using a data base.
- *Education:* The DBA is responsible for all data base-related education. Students include systems analysts, programmers, operations personnel, corporate management and DBMS users.
- *Security:* Three levels of security have been provided by passwords. The highest level protects functions such as changing data base definitions, structures and passwords. The second level controls the authority to update a data base. The lowest level controls the retrieval of information.
- *Technical Knowledge:* A DBA must keep up with the technical features of his particular DBMS and with effective methods for applying data base technology in general.

Update Offers Data Sharing

(Continued from Page 43)

(LSO) available in IMS/VS Version 1 Release 1.6 by allowing LSO to run on MVS/System Products Release 2, utilizing MVS cross-memory services.

Planned availability date for IMS/VS Version 1 Release 2 is June 26, 1981, with the exception of the data-sharing facility. An early support program for this will begin in June, but general availability is set for December 1981.

Monthly charge for the data base system including the data sharing feature is $1,045, with the DC facility costing $1,265 per month and DBRC priced at $258 per month.

Now, unleash the true power of your 4300-type processor.

When you chose a new 4300-type processor, it was to upgrade system performance and reduce ownership costs. Yet, if you select the wrong tape subsystem — a subsystem whose performance is not "balanced" with that of your processor — you can actually strangle throughput and reduce system efficiency. On the other hand, if you choose STC's new 4500 tape subsystem, you can achieve a balanced system, and get all the throughput and CPU utilization for which you've paid.

A subsystem matched to your processor.

The new STC 4500 is fully compatible with today's intermediate-sized processors, including IBM 360, 370 and 4300 series devices, as well as other comparable units. But more importantly, the STC 4500 incorporates speeds of 75 and 125 ips, and densities of 800 bpi (NRZI), 1600 bpi (PE) and 6250 bpi (GCR). This combination of high-speed and high-density permits the 4500 subsystem to deliver performance equal to that of your CPU, to help achieve a balanced system.

For example, if you compare an STC 4500 with today's streaming tape devices, there's no comparison at all. In data mode, a streaming tape will typically transfer data at a rate of about 20 kb per second, while the STC 4500 offers a data rate of 468 or 780 kb per second. When you use the STC 4500 to backup a high-performance disk, it outperforms 8809-type devices (see chart below) by a factor of six to one. If you consider total time, this expands to a differential of eight to one, and with 3410 subsystems, the difference is almost nine to one. In sum, the STC 4500 makes frequent disk backup a realistic and cost-efficient alternative — no matter your workload — and at your convenience.

Equally important, the 4500 subsystem also offers enhanced read/write reliability. Users who move from non-STC 1600 bpi (PE) to STC 6250 bpi drives and who take advantage of GCR blocking can reasonably expect an increase in megabytes processed per soft failure of 30 to 35 times that of PE, and an increase in gigabytes processed per hard failure of 18 to 20 times.

Reduced ownership costs.

Older, 3420-type tape subsystems deliver good performance in certain applications. But their price/performance ratio falls far short of that which you'd expect with a 4300-based system. In comparison, the STC 4500 — like a 4300 processor — was designed for use in any office environment. As you can see from the accompanying chart, this means a reduction of 40% or more in space, power, and air conditioning costs, and eliminates the need for raised flooring entirely. And in this age of spiraling inflation, this can be an important long-term consideration indeed.

SPACE/POWER/AIR CONDITIONING

	3803-2 2 3420-6	4550 4554	SAVINGS
POWER (Avg. KVA)	5.12	3.06	40%
BTU/HR. (Avg.)	14,980	9,197	40%
SPACE (Sq. Ft.)	18.4	11.3	40%

Features you get only from STC.

The new STC 4500 also gives you several important features you'll find on no other comparable subsystem.

For one thing, the 4500 is a tri-density subsystem. Thus, it eliminates the need for a separate, additional 800 bpi drive. This helps reduce your initial investment, as well as your total cost-of-ownership.

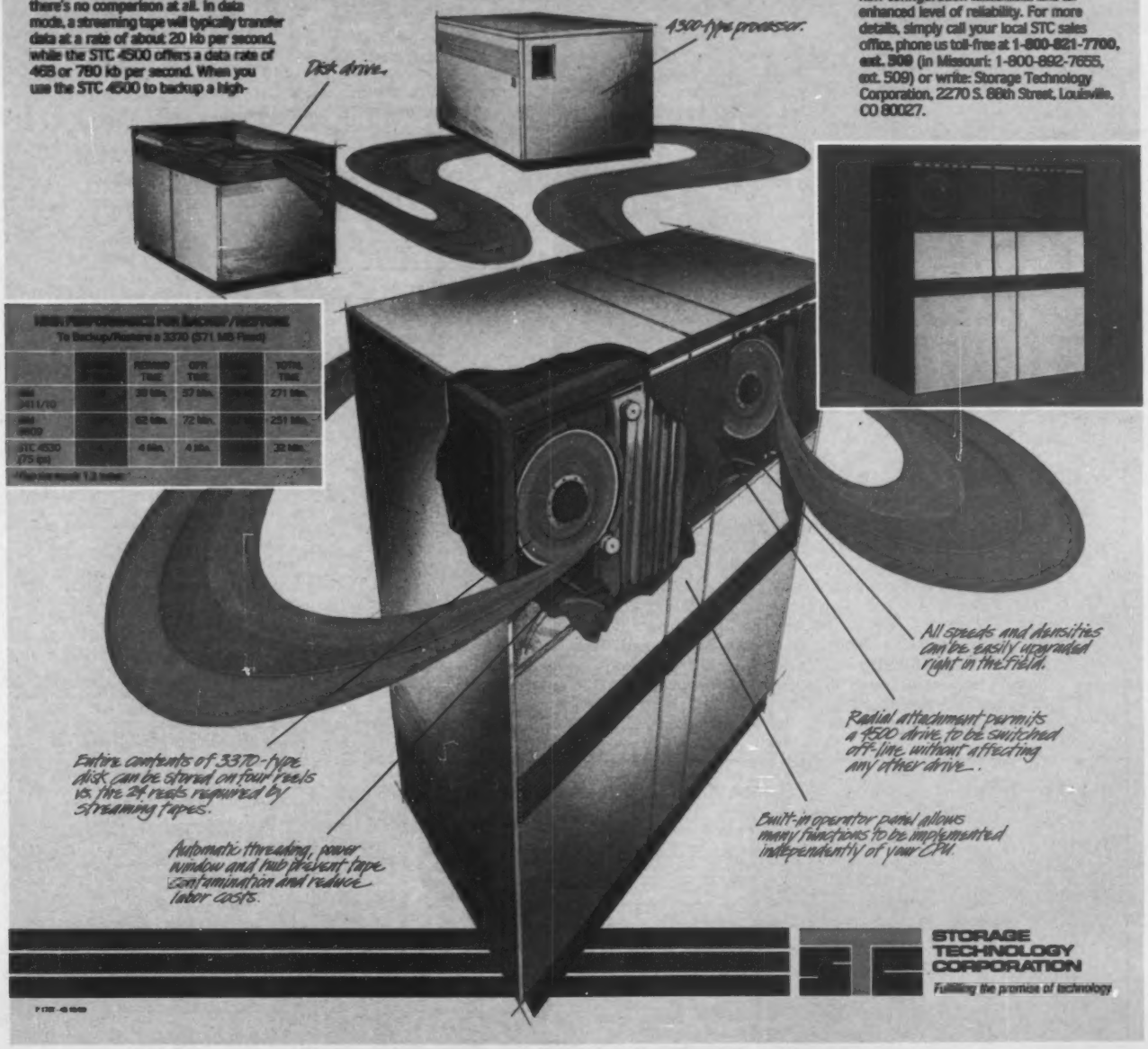
STC's new 4500 tape subsystem can be diagnosed either on-site or remotely. In either event, if one 4500 drive goes down, it can be diagnosed in-line, and serviced off-line without affecting the remainder of the subsystem's operations. Powerful, built-in diagnostics also help assure enhanced data availability. In fact, the STC 4500 has microprocessor-based diagnostics designed to make fault isolation faster and more effective by permitting the subsystem to be exercised in-line. And special "wake-up" diagnostics will exercise the memory, microprocessor, and interface at power-up to assure proper operation.

Proven STC technology.

The STC 4500 was designed around technology that has been tested and proved in some of America's largest, and most demanding, data processing shops. In fact, STC is far and away the world's largest supplier of high-performance tape subsystems for the big processor market. And in the 4500 tape subsystem, we've made all this experience and expertise available to the intermediate system user.

Call now.

Find out for yourself how an STC 4500 tape subsystem can help you achieve a balanced system, reduced cost-of-ownership, new configuration flexibilities and an enhanced level of reliability. For more details, simply call your local STC sales office, phone us toll-free at 1-800-821-7700, ext. 509 (in Missouri: 1-800-892-7655, ext. 509) or write: Storage Technology Corporation, 2270 S. 88th Street, Louisville, CO 80027.



HIGH PERFORMANCE FOR BACKUP/RESTORE
To Backup/Restore a 3370 (571 MB Fixed)

		REWIND TIME	CPY TIME		TOTAL TIME
3411/10		20 Min.	37 Min.		271 Min.
8809		62 Min.	72 Min.		251 Min.
STC 4530 (75 ips)		4 Min.	4 Min.		32 Min.

*Plus one round 1.3 miles

STORAGE TECHNOLOGY CORPORATION
Fulfilling the promise of technology

Word/Text Processing Aid Operates on IBM's Series/1

TUSTIN, Calif. — A word/text processing software system for the IBM Series/1 is now available from Royal International Software Systems (RIIS). Written in Series/1 assembly language, it runs in approximately 13K bytes under the RPS operating system and 16K bytes under the EDX operating system.

RIIS says that up to four source files may be merged to produce a document along with multiple copies and complete page and text definition. Standard features include "text fill" mode headings, subheadings, footing, table of contents, right margin justification, tab stops and numbered paragraphs.

The price of the RIIS Text Processor is $1,850 which includes six-month maintenance and system manual. RIIS is at Suite 206, 202 Fashion Lane, Tustin, Calif. 92680.

'Prompt' Backs EDX on Series/1

SHELBYVILLE, Ky. — Version 7 of Mid-American Control Corp's (MAC) Prompt software package is said to support IBM's new release of its EDX operating system (Version 3) for the Series/1 minicomputer.

Built around the firm's Prompt Data Base Facilities, MAC offers a full line of financial application software products: Guide, for the private sector of business, and the Public Budgetary Accounting (PBA) product.

Guide typically costs $18,000 to $20,000, including Prompt, as does PBA, according to a company spokesman. Prompt alone sells for $6,000 from the firm at U.S. 60 West, P.O. Box 57, Shelbyville, Ky. 40065.

System/3 Gains Tape Manager

DARIEN, Ill. — Financial Systems and Services has added the Tape Management System to its Retail Store Systems package for IBM System/3 users.

The Tape Management System organizes and manages a tape library that controls and structures tape operations.

It can be installed in large System/3 shops with four tape drives and 2,500 reels of 2,400-ft tape, the vendor said.

The Tape Management System costs $180 on a 12-mo license fee. Financial Systems and Services is at 805 Plainfield Road, Darien, Ill. 60559.

Harris Minis Get CAD Support

HOUSTON, Pa. — A computer-aided design (CAD) software package called Ansys is being offered to Harris Corp. 500 and 800 minisystems users by Swanson Analysis Systems, Inc.

Ansys, a finite-element CAD package, was designed for engineers dealing with structured analysis, heat transfer, thermal fluid flow, thermoelectricity and wave motion analysis. Data can be graphically reviewed as input and can also be modified at that time.

Interactive graphics is also available with the system which costs $2,000/mo. Swanson Analysis Systems can be reached at P.O. Box 65, Houston, Pa. 15342.

Auto-Trol Enhances Graphics Turnkey

DENVER — Auto-trol Technology Corp. has announced software enhancements to two components of its turnkey graphics system.

AD/380, an automated design and drafting package, has been enhanced to include mapping features for forestry management, agricultural management and land use applications.

The firm's GS-2000 has been enhanced to include system security capabilities, pattern system storage and the ability to concurrently create plotter files and continue with design operations, the vendor said.

Auto-trol turnkeys start at $150,000, the vendor said from 12500 N. Washington St., Denver, Colo. 80233.

The Data Base Machine

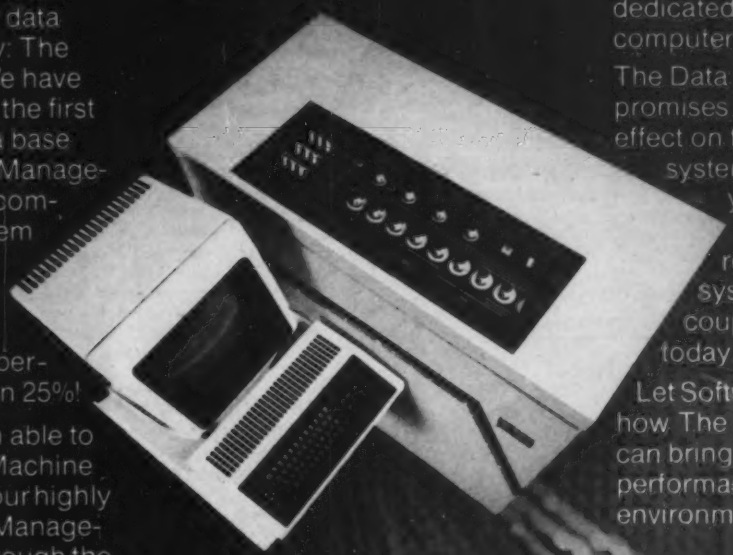
Now, the first practical data base system permits a company to off-load over 70% CPU time – and get more than 25% increase in data base performance, too.

Software AG announces a major breakthrough in data processing technology: The Data Base Machine. We have succeeded in building the first practical backend data base system — a Data Base Management System without compromising overall system performance.

In fact, The Data Base Machine can actually increase total system performance by more than 25%!

Software AG has been able to build The Data Base Machine because of ADABAS, our highly respected Data Base Management System. Only through the architectural simplicity of this unique DBMS has a real-world solution to the problem of overhead trade-off and throughput efficiency been possible.

By using The Data Base Machine a company can at last recover valuable CPU resources, while actually increasing data base performance — without the need for expensive computer upgrade.



The Data Base Machine also provides the foundation for the development of a true Distributed Data Processing environment — the creation of networks in which functions are decentralized into easy-to-manage subsystems through dedicated, high-performance computers.

The Data Base Machine promises to have a significant effect on the data processing systems of the future. If you'd like to know more about this revolutionary software system, simply fill in the coupon, and mail it in today.

Let Software AG show you how The Data Base Machine can bring greater cost-effective performance to your DP environment.

Name _____
Title _____
Company _____
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City _____
State _____ Zip _____
Telephone No. _____
Computer _____
Operating System _____
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1124

Library for HP 3000 Shops Aids Programming Staffs

LEXINGTON, Mass. — Release 3 of the Programming Aids Library (PAL) for programmers and DP managers of Hewlett-Packard Co. HP 3000 installations has been introduced by Wallach & Shepherd Associates.

The library includes Palsta, a store tape analyzer that analyzes backup and store tapes; Pack and Unpack programs that reportedly reduce space required for on-line data and source code files that are accessed infrequently; and Include, which provides for the inclusion of data, text and program source code in a job stream.

Setterm is said to change the characteristics of a log-on terminal without requiring a log-on; and Termio is a terminal I/O system that allows rapid development of interactive programs.

Release 3 of PAL is available for a free 30-day trial and rents for $100/mo including maintenance, periodic updates and new routines and features, a spokesman said from 3 Wallis Court, Lexington, Mass. 02173.

On PDP-11s

Unix Code Control Backed

BATVIA, Ill. — The Unix Source Code Control System (SCCS), a package for controlling changes in text files, has been released by Uniq Computer Corp.

SCCS runs under Version 7 of the Unix operating system, distributed and supported by Uniq for the Digital Equipment Corp. PDP-11/23, 11/34, 11/40, 11/44, 11/45 and 11/70 minicomputer.

Providing facilities for storing, updating and retrieving multiple versions of a text file, SCCS administers changes, controls updating and retrieving multiple versions and controls updating privileges.

The package also records the make of each change, when and where it was made and why.

SCCS costs $7,500 from Uniq Computer, 143 First St., Batvia, Ill. 60510.

Cobol Generator for TI Mini

HARRISBURG, Pa. — An interactive Cobol program generator initially designed for Texas Instruments, Inc., DS990 minicomputers reportedly produces the Ansi 74 Cobol source code required for master file creation and maintenance programs.

Working from program design notes, file descriptions and screen layouts, Generato can produce programs within a half hour, according to the generator's vendor, Accudata, Inc. Because no further linking of output is required, programs can be immediately compiled and executed, a spokesman noted.

Priced at $5,000, the Generator is marketed for either the one-programmer installation or large software houses.

Accudata is at 4601 Locust Lane, Harrisburg, Pa. 17109.

Package Ties TI 990, PM550

MILFORD, Ohio — A network software package designed to interface the Texas Instruments, Inc. Model 990 computer with one or more TI PM550 programmable controllers has been unveiled by Computer Technology Corp.

The PM550 Network Software Package (NSP) — a control and monitoring package — allows two-way access to each PM550 controller, either through a computer terminal or from a user's program, according to the vendor.

In systems using multiple PM550 controllers, the NSP is said to give the 990 computer both monitoring and control functions. The computer can automatically make programmed changes in any or all controllers, as required, the vendor said.

The package costs $2,500 from the firm at Park 50 Technecenter, 2002 Ford Circle, Milford, Ohio 45150.

System Assesses Bank Profits

OAK BROOK, Ill. — Software that allows a bank to assess the profitability of each of its commercial accounts has been released by the Weiland Computer Group.

The Analysis/Profitabilty Extension (APX) system can be used in conjunction with Weiland's Demand/Deposit Credit Reserve System (which provides all basic input or as a stand-alone system. It can focus on a single account or a family of related accounts into groups for analysis purposes.

Service charging options include monthly, quarterly, semiannual or annual cycles along with historical reporting for current month, year-to-date, last year and second-to-last year cycles.

APX provides a set of reports including monthly and periodic analysis worksheets, a charge control summary and a monthly analysis book as well as a customer's analysis statement and charge notices generated for mailing.

As of Jan. 1, 1981, the price of the APX system will be $20,000. Weiland is at 1515 W. 22 St., Oak Brook, Ill. 60521.

'Visicalc Plus' Update Operates on HP-85

PALO ALTO, Calif. — Visicalc Plus software is now available on Hewlett-Packard Co. HP-85 personal computers.

The product features line charts, bar charts and curve-fitting graphs.

The product sells for $200 in computer stores and in office equipment dealers who sell the HP-85, the vendor said from 1501 Page Mill Road, Palo Alto, Calif. 94304.

Interactive Storage Analysis

Tool Backs PDP-11 File Design

SCHAUMBURG, Ill. – A storage analysis program said to allow a designer of files on PDP-11 minicomputers to interactively determine record characteristics and reduce the amount of needed file space has been introduced by Reicor Systems, Inc.

In addition, the total amount of disk space required to store records on the file can be calculated for any number of records.

STOR-11 can be used by any organization using DEC's Record Management System (RMS-11).

STOR-11 produces three reports at the user's terminal indicating the effects of a given record size and bucket size on the disk space required to store the data.

The designer can minimize the amount of unused space by selecting certain file characteristics. The user can then enter estimates of the number of records on the file and STOR-11 will compute the number of M bytes needed. Generated reports can be saved for printing at a later time.

The STOR-11 program is available immediately for $895.00 and can be obtained from Reicor Systems, Inc., Suite L, 1305 Remington Rd., Schaumburg, Ill. 60195.

Directory Covers Data Base Groups

SANTA MONICA, Calif. – A directory that describes more than 600 data bases or distinctly named files in a data base family available through one or more of 93 on-line service organizations, is available from Cuadra Associates, Inc.

The Directory of On-Line Data Bases includes data base services that are available in only one country or a limited set of countries, the vendor claimed.

The directory is published quarterly and a subscription includes two complete editions per year and two update supplements. The price is $60, the vendor said from Suite 12, 1523 Sixth St., Santa Monica, Calif. 90401.

Asset System Fits PDP-11

PLYMOUTH, Ind. – A fixed assets system for Digital Equipment Corp. PDP-11 minicomputers using the RSTS/E or CTS operating systems is available from Plycom Services, Inc.

The system gives management an asset reporting capability over such areas as auditing, property taxes, asset movement, acquisitions and disposals, as well as typical book and tax depreciation reporting, the vendor claimed.

The price for the system is $4,000 from the vendor through P.O. Box 160, Plymouth, Ind. 46563.

Planning System Runs on TI Gear

ROSWELL, Ga. – The Computerized Operation Planning and Engineering (Cope) software package from Antech, Inc. reportedly will allow budgeting, planning, financial modeling, engineering calculations and property acquisition evaluation.

Cope is said to provide for the small computer user the type of planning software previously available on large computer systems through time-sharing service bureaus.

Designed to operate on the Texas Instruments, Inc. DS990 Model 1 computer, Cope can be purchased for $13,500, including the computer, double-sided, double-density floppy disks, a TI 810B printer and a word processor.

The software alone costs $400 from 225 Corinth Court, Roswell, Ga. 30075.

CDC Program Aids Architects Via Cybernet

MINNEAPOLIS — A program designed to help architects pinpoint the energy demands of a building is available through the Cybernet Data Services of Control Data Corp.

ESP-1 — previsoulsy available only to members of Automated Procedures for Engineering Consultant, Inc. (Apec), which developed it — is now available with no initial fee to non-Apec members.

ESP-I is said to offer the means for modeling the performance of heating, cooling and other energy-consuming systems or equipment. It stimulates the building's mechanical systems on an hourly basis, taking into acocunt the building's heat gain and loss, weather data, operating schedules and building thermal storage and its analysis.

Program users pay only for computer time, a spokeswoman said form the firm at Box O, Minneapolis, Minn. 55440.

Program Aimed At Oil Refiners

SANTA CLARA, Calif. — A process simulation program said to solve the design and operating problems associated with refining crude oil has been added as a service on the Optimum Systems, Inc. (OSI) remote computing network.

The program was developed by Oleson & Associates. of Fullerton, Calif., to treat a multiunit separation system as an integrated entity.

The cost of PS-01 varies according to the specific usage by each customer, OSI said from 2801 Northwestern Pkwy., Santa Clara, Calif. 95051.

Surcharge Off On OAG Data

NEW YORK — As a result of a new agreement between I.P. Sharp Associates, Inc. and Official Airlines Guide, Inc. (OAG), the surcharge associated with the OAG Time-Sharing data base has been dropped.

The two companies are hoping that this change will encourage users to examine new applications for this data.

Users of OAG data must still sign a copy of the OAG contract in order to access the data on the I.P. Sharp system. Existing customers of the data base do not need to reprocess their current agreement, since the new arrangement automatically applies to all users.

'MSC/Nastran Runs On UCS' Cray 1

OVERLAND PARK, Mo. — MSC/Nastran, a structural analysis system, was available on United Computing Systems, Inc.'s Cray-1 supercomputer as of Nov. 1.

Nastran was originally developed in the late 1960s for the National Aeronautics and Space Administration.

United Computing is headquartered at 5454 W. 110 St., Overland Park, Kan. 66211.

Package Tests Solar Design

BERKELEY, Calif. — The Berkeley Solar group (BSG) is offering architects and engineers the use of a Data General Corp. MV/8000 and a software package to analyze passive solar home designs.

The program, called Calpas3, is available through GTE's Telenet Communications Corp.'s Telenet network.

Users need a computer terminal and a modem to access the BSG system. Access to the system and Calpas3 costs $100 for a start-up fee and $10 per Calpas3 run, the vendor said from 3026 Shattuck Ave., Berkeley, Calif. 94705.

'SAS' Available In Two Modes

CHICAGO — Computer Research Co., a subsidiary of Comshare, Inc., has announced that Statistical Analysis System (SAS) capabilities are available in time-sharing or batch mode through Computer Research's remote computing services.

SAS will allow users to plot data and values, perform regressions and print data reports, all on one computer job, according to a spokesman.

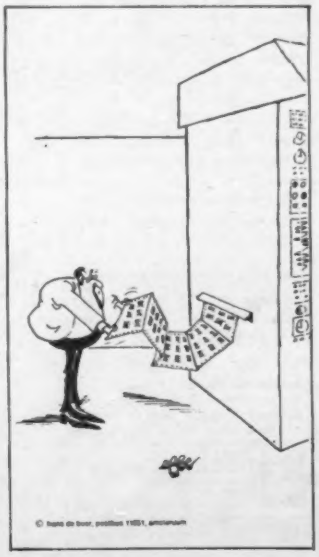
Comshare is headquartered at 3001 S. State St., Ann Arbor, Mich. 48106.

'Code V' Cuts Cybernet Costs

PASADENA, Calif. — The NOS 176 release of Optical Research Associates Code V software program offers lens designers use of Code V programs at cost savings one-half to one-third the previous version's charges, the vendor claimed.

The software runs on Control Data Corp.'s Cybernet Services network and is an integrated package of optical design and engineering programs.

The price for the software is based on computer time used, the vendor said from 550 N. Rosemead Blvd., Pasadena, Calif. 91107.



Local-Area Net Alternative Discussed

Big Users Need Big Nets, Right? Wrong

By Brad Schultz
CW Staff

LOS ANGELES — Large data communications users do not need large all-encompassing networks, a recent Interface West session was told here by consultant Jon S. Gould of O'Donnell & Associates.

A very complex problem, such as solving the data communications needs of a geographically dispersed user, should be broken into a set of smaller problems, the former vice-president of Citibank, Interdata Corp. and DDP Systems, Inc. indicated. The user should therefore concentrate on communications among adjacent buildings at each dispersed location, rather than the total communications process among all locations.

Local-area networks handle at least 60% of a typical large user's electronic traffic, Gould said, and deserve the bulk of development dollars when a user decides to upgrade communications resources. By focusing on the local net predicament of each location and, when that is resolved, "latching" local nets together to form the total network, a user is better positioned to manage the network as the organization it serves changes, Gould advised.

Vested Interest

Vendors have a vested interest in convincing users to take the all-encompassing approach, Gould observed. By attempting to sell systems, peripherals, link equipment and associated software as supplies for the total network, the manufacturer is maneuvering to lock the user into sole source dependence, he warned.

Yet no large network can be supplied by only one vendor and successfully meet a dispersed user's contemporary data communications needs, Gould continued. Because companies typically undergo major reorganizations over the lifetime of a network — especially when they participate in acquisitions or mergers — data communications among their nodes entails considerable traffic between dissimilar equipment from different manufacturers.

Unfortunately, some of the emerging network architectures fail to accommodate dissimilar devices, Gould remarked. And the integration of word processing (WP) with DP tends to make matters worse since those forms of information are transmitted in much different ways.

Although data communications managers must come to terms with this integration, they should recognize that WP is not transaction-oriented like DP, Gould continued. Words typically pass in one direction and in large volumes, whereas data typically passes in both directions along a link and in small volumes on a query/response basis.

Thus, attempts to sell the user equipment that can handle both kinds of information may have limited relevance to the user's true needs, Gould suggested. In fact, manufacturers' solutions are typically opposed to user needs, he asserted, because manufacturers themselves do not have the resources for marketing products that can fully meet the needs of most users.

Self-Imposed Dilemma

By trying to be sole source suppliers of large networks, vendors place themselves in the dilemma of attempting to develop general-purpose products for applications that can vary significantly from user to user, Gould told the Interface West session.

Hence, vendors have had great difficulty in bringing cure-all architectures to market, he said, naming IBM's Systems Network Architecture (SNA) and AT&T's Advanced Communications Service (ACS), as examples.

Gould said much of SNA's reported capabilities are a "myth," since they cannot be applied with the generality advertised by IBM and remarked that "nobody knows where ACS is."

When large networks fail to perform as expected, their prob-

(Continued on Page 54)

Net Management Seen Key To Communications Planning

By Michael Belitz
Special to CW

The complexity of most data communications systems today makes network planning synonymous with network management.

Drawing up a schematic and installing equipment might produce workable results — but probably not manageable ones. While good physical design and suitable equipment remain essential to efficient and economical network operation, their benefits rapidly diminish without proper diagnostic and management controls.

Prior to the advent of those considerations, excessive mean times to repair, error rates and downtimes inevitably defeated the best intentioned plans.

Three Basic Systems

Thus when users plan systems of any magnitude today, they plan the management of those systems more than anything else. Three very basic types of diagnostic systems exist: Qualitative, quantitative and microprocessor-driven combinations of both.

The latter, for the purpose of discussion, can be called a communications management system. All use a low-speed, frequency shift keying secondary telemetry channel to access line and modem testing features.

In many systems, each modem also has a built-in secondary channel. Signals from a central-site controller can put specific modems into test modes to determine if faults exist in lines, interfaces or modems. These signals can also be used to activate various remote-control devices incorporated into the system.

A qualitative system monitors network performance between preset points. When these parameters are exceeded, an alarm notifies the operator that a fault exists. Tests must then be conducted to determine the fault and its location.

A quantitative system provides central-site operators with specific information concerning faults, including their nature and location. With this information, the central-site operator can determine if an abnormal condition will affect the integrity of network transmission and if reconfiguration is required.

To facilitate network reconfiguration, for example, central site operators may use remote-control devices for automatic dial backup for the correction of leased-line problems, or remote modem transfer switches in the case of modem malfunctions.

(Continued on Page 54)

The World's First NonStop™ DBMS

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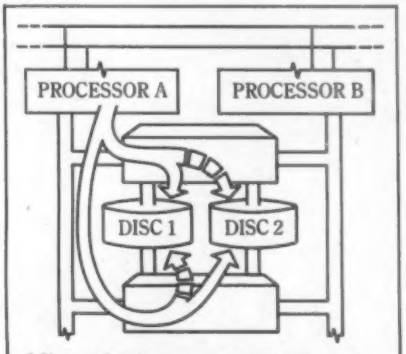

Mirrored volumes automatically maintain identical copies; write operations occur simultaneously, read operations performed using drive with head closest to data.

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Each individual system can be expanded to sixteen processors, with additions of memory, terminals, discs, and there will be no loss whatsoever on the original investment—hardware or software.

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Automatic Terminal Management.

Terminal management has been the classic nightmare of on-line data base systems. No more. ENCOMPASS automatically handles support for the Tandem 6520 Multi Page Display, Tandem 6510, and IBM 3270. The Tandem system also supports a variety of communication methods and protocols, including Asynchronous, Bisynchronous, Multipoint, Point to Point, X25 and SDLC.

Screen formatting, data validation, screen sequencing and data mapping, plus sequencing and control of multiple terminals; these are all handled for the application programmer automatically and at a fraction of the cost in development time and dollars.

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Consistency of the data base is essential. Multiple files must be capable of being updated simultaneously, even if located across distributed nodes. If for any reason a transaction cannot be 100% completed, this is the one system in the world which can un-do it completely. Automatically.

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Because of its unique architecture, the system will keep on running without interruption, without loss or duplication of a transaction-in-process even if a failure occurs in any processor, I/O channel, disc or disc controller.

Tandem NonStop™ architecture provides not only this redundancy in hardware, but the software to take advantage of it, utilizing all available resources.

The NonStop™ system ensures that every update is completed to the data base. And with ENCOMPASS DBMS, NonStop™ operation is automatically built into all of your programs.

On-line's as easy to program as batch.

One key theme behind the performance and reliability of our NonStop™ DBMS, ENCOMPASS, is the ease of use for programmers, systems designers and users.

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- on-line data base backup
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- efficient query-report generation
- dynamic and automatic adjustment to varying transaction loads

All that remains for the user is:

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What could be simpler?

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Loop Test System Out For IBM 3600 Users

RICHMOND, Calif. — Support Systems International (SSI) is offering the Model DT-1 loop test system for users of IBM 3600 financial communication systems.

The DT-1 consists of a loop cable, a battery-operated control box, a diagnostic test block and 15 shorting plugs.

The test system was designed to detect shorts, opens, miswires or reversed wires in local loops. It may also be used for initial testing of new installations and for troubleshooting existing systems.

Interruptions in the integrity of new or existing loops are signaled by indicator lights and an audible alarm, defeatable by a front-panel switch, according to SSI.

Priced at $385, the unit is supplied in a carrying case with inserts for protection.

Support Systems International is at 150 South St., Richmond, Calif. 94804.

Success Rides on Management

(Continued from Page 51)

The third type of system, or the microprocessor-driven combination, enables the central site operator to know when and where a failure has occurred and the element that has failed (a circuit, terminal, modem, multiplexer and so forth). Through restoral hardware, the operator can dial up remote locations and place remote equipment back on-line immediately.

The system then permits the operator to correctly dispatch either internal or vendor organizations to correct the malfunctioning unit. These functions give the user a tool for managing not only their networks, but also their service organizations, regardless of site location and geographics.

The latter system is preferable for obvious reasons, but it is also the costliest. However, because a data communications system, once installed, normally represents a fixed cost, overall network economics cannot exist in medium- or large-scale networks without some form of it.

Such a system consists of central-site diagnostic controllers that are computer systems in themselves. They have their own CPUs, disks, I/O, terminals and associated equipment.

However, the controller is used only for diagnostics and control management. The controller communicates with all remote devices — modems, switches, terminals and more.

Small networks use controllers that handle eight- to 16 communications circuits. Medium-sized networks use controllers that handle up to 32 circuits, and still larger scale networks use more powerful controllers that handle over 200 circuits.

A popular medium- and large-size controller, for example, has a 10M-byte hard disk that retains significant information about modems, switches and other devices, their physical location in a network and their relationship to each other. It has the ability of four functions on a single terminal or operator.

The largest of the controllers offer 16 functions among four operators. In such networks, both backbone and remote modems are microprocessor-driven. They have certain programming capabilities to perform specific tasks, such as transmitting serial numbers, functional temperatures, faults that have occurred within or around them and the nature of the problem itself.

Communications management systems of these kinds apply computer disciplines to traditional network management techniques and offer software packages to provide users with programs for information management, problem management, inventory management and installation management.

New Concept

The concept itself is not a new one, but rather an adaptation of a management information system — a data base where the user can store and manipulate information, secure meaningful reports, enter information and build applications.

In effect, it permits the user to define proprietary problem formats. Each user has problems unique to specific system goals, and this function represents the utility to define the fields to be recorded.

The user can also obtain daily reports, files and interactive references from the system. For example, a user can obtain a daily report of outages of any specified duration by location and sorted order.

From this capability, the user can also obtain reports utilizing any appropriate files from the system. The user can locate inventory, for example, which is decidedly advantageous in systems containing thousands of remotely located terminals, controllers, modems, cables, multiplexers and other devices.

The user can also control installation management from the basic management application package.

Most users use standard procedures for installing equipment. Site survey, network design, equipment specification and purchasing procedure — as well as curcuit installations and the like — are benchmarked into a program that coordinates timely network installation and training for staff.

Michael Belitz is assistant to Racal-Milgo, Inc.'s vice-president for sales and marketing.

Exec Cautions Net Users

(Continued from Page 51)

lems tend to increase the revenues of suppliers, Gould pointed out. In fact, typical large networks are developed in two to three years through three stages: They fail the first time, are late the second time and are simply disappointing the third time they are tried out. "That's when you rewrite the specifications," he said.

Gould identified two types of networks: Those directly offered by systems manufacturers and those sold as a service. While SNA exemplifies the first type, the Defense Department's Arpanet was said to fall into the second type. Linking a number of universities, government agencies and research organizations, Arpanet is supported by $20 million of software written with public funds, Gould noted.

As further examples of the service type of network, the Telenet and Tymnet packet-switched offerings from GTE Telenet Communications Corp. and Tyment, Inc., respectively, can go a long way towards solving some users' problems, Gould indicated.

However, he said users must learn to position themselves carefully in acquiring those services and other products because their needs will change in time.

Memorex Expands 3278-Type CRT Terminals

CUPERTINO, Calif. — Memorex Corp. has released three CRT terminals and a remote cluster controller designed to operate with IBM 360, 370 and 30 series mainframes.

The 2078 models 3, 4 and 5 are functionally equivalent to the IBM 3278 and increase character screen capacity from 1,920 char. (Model 2) to 2,560 char. (Model 3), 3,440 char. (Model 4) and to 3,564 char. (Model 5), using a 132-char. line.

The 2078 also uses 58% less power and generates 47% less heat than the IBM 3278, the vendor claimed.

The 2078 is available with five keyboard options: 75-key data entry, 75-key Ebcdic typewriter, 75-key Ascii typewriter, 87-key Ebcdic typewriter and 87-key Ascii typewriter.

The nonglare screen reduces operator eye fatigue, while the tilt-screen option allows the operator to position the monitor for optimum readability, the vendor claimed.

To reduce screen burn and extend monitor life, a feature automatically dims the display if there has been no activity from the keyboard for approximately 20 minutes.

A line and column indicator displays the line and column location of the cursor and the status of the system, cluster and terminal.

The purchase price of the 2078 ranges from $2,431 for the Model 1 with the 75-key data entry, to $3,565 for the Model 5 with the 87-key Ebcdic typewriter keyboard.

The 2076 remote cluster controller supports all four models of the 2078 or IBM 3278 and features three types of diagnostic capabilities for fault detection and isolation.

The 2076 costs $4,494, the vendor said from San Tomas at Central Expressway, Santa Clara, Calif. 95052.

IBM-Type CRT Needs No Modifications

RALEIGH, N.C. — Custom Terminals, Inc. has provided IBM 2740 and 3767 users with what it said is an economical way to add a display to existing or planned networks with no hardware or software modifications.

The CTI 1000 CRT terminal will provide hard copy by supporting up to two printers either as slave units or directly addressable by the host processor, the firm said.

The microprocessor-based unit features a 12-in. diagonal screen with 23 80-char. lines. A 24th line features operator status and diagnostics.

CTI 1000 increases data throughput by means of a print-through feature, the firm said. CTI 1000 operators can initiate a transaction, send that transaction to the host for processing and begin work immediately on the next transaction without waiting for a response from the host.

With the two-printer capability, messages from the host can be routed selectively to either printer or, if operator interaction is required, to the display.

Screen formats, operator prompts and other productivity aids can be created at a central location and loaded down-line to CTI 1000 terminals.

In a standard configuration, the CTI 1000 costs $2,350. Custom Terminals can be reached through P.O. Box 19906, Raleigh, N.C. 27619.

CUE XVI Set For Atlanta

ATLANTA — The Comten Users Exchange (CUE XVI) will be held April 27-May 1 at Dunfey's Hotel here.

Most sessions are geared to users or potential users of NCR Corp.'s Comten product lines. The Thursday sessions will be devoted to "Communications Challenges of the '80s."

Scheduled sessions include "The Common Carrier: User Options," "Disaster Backup Systems," "Network Management Systems" and "Communications Economics of the '80s."

The fee is $150 for the week or $75 for Thursday only. More information is available from Marilyn Cianciolo, General Motors Research Labs, GM Technical Center, Warren, Mich. 48090.

Modem Nest Houses Up to Eight Cards

MANSFIELD, Mass. — Codex Corp. is offering the MX 2400 Series Multiple Unit Nest, designed to house card versions of its MX 2400 modems. The nest allows up to eight individual card modems in a single nest.

In addition, all options for the MX models may be added to the card modems without decreasing the number of cards that can be housed in the nest, the vendor claimed.

Any combination of the three MX 2400 models can be used in the nest — the basic 2400 modem for 4-wire leased line operation, the dual dial-restoral version, equipped for 2-wire dial backup and the 2400 dial modem for 2-wire operation.

The price for the nest is $2,125, the vendor said from 20 Cabot Blvd., Mansfield, Mass. 02048.

Basic Four Users Offered Editing CRT Terminal

BURBANK, Calif. — Basic Four Corp. users are now being offered a CRT terminal by Southwest Data Systems, Inc. that features editing capabilities, screen formatting, modular construction and a customer warranty.

Several features formerly not available to Basic Four users, have been incorporated into the R725, according to the vendor. All function control switches are accessible from the rear panel, including bit/sec rate, parity, mode and reverse video. Each unit comes equipped with upper- and lowercase with descenders and an auxiliary interface for serial peripherals that includes "print transparent" capability.

The R725 costs $1,875 from Southwest Data Systems, Inc., 2509 Empire Ave., Burbank, Calif. 91504.

Cable Tester Debuts

PHOENIX — A low-cost cable tester that displays continuity and cross-wiring end to end and jumpers within an end of 25-wire EIA cables has been introduced by McKeon Microsystems.

Pressing any one of 25 separate push-button switches will display the configuration for the selected line using two sets of LEDs, the firm said.

The cost for the cable tester is $350 from McKeon Microsystems, 19810 N. 17 Drive, Phoenix, Ariz. 85027.

CSI Issues SNA Guide

SAN JOSE, Calif. — Communications Solutions, Inc. (CSI) has published the *SNA 3270 Design Guide*, designed to aid manufacturers in developing IBM 3270 products compatible with IBM's Systems Network Architecture (SNA).

Also meant to help users evaluate SNA-compatible products, the 300-page report is part of CSI's Data Communications Technology Series, which covers the latest developments in the data communications field.

The publication costs $950 and includes a one-year quarterly update service.

CSI is located at Suite 200, 4040 Moorpark Ave., San Jose, Calif. 95117.

Multiplexer Supports X.25

GERMANTOWN, Md. — Digital Communications Corp. (DCC) has released a switching multiplexer which reportedly combines the features of a digital matrix switch, a port connection unit and a statistical time division multiplexer into a single product.

The Model SM9200 offers the user port selection, port contention, user-defined contention groups, speed conversion, X.25 Level 2 support and expandability.

The price for a four-line unit with support capabilities is $2,350, DCC said from 11717 Exploration Lane, Germantown, Md. 20767.

Telcon Makes Terminals to Go

FT. LAUDERDALE, Fla. — The Ambassador III and IV portable terminals by Telcon Industries, Inc. weigh less than 20 lb and were designed to be taken anywhere.

The Ambassador III features a built-in 300 bit/sec acoustical coupler and the Ambassador IV provides a built-in 80-column printer with electric discharge at two line/sec. Both terminals feature a Selectric-style keyboard.

The two terminals incorporate full 7-in. diagonal CRT terminal screens that provide 24- by 80-char. display using 128 Ascii char. set.

The terminals work in both page or char. mode and feature transmission in seven- or eight-level code at a data rate keyboard selectable anywhere from 110- to 9,600 bit/sec, the vendor said.

The Ambassador III costs $2,895, and the Ambassador IV costs $3,495 from the vendor at 1401 N.W. 69 St., Ft. Lauderdale, Fla. 33309.

Rixon Modem 'Two in One'

SILVER SPRING, Md. — Rixon, Inc. is offering a modem it claims is two modems in one.

The ACM300/1200 can operate as either a 0- to 300 bit/sec, asynchronous, full-duplex modem or a 0- to 1,200 bit/sec asynchronous, half-duplex modem, a spokesman said.

The feature is switch-selectable and allows the modem to transfer low- or medium-speed data over normal voice grade lines using commonly available telephone sets.

The product costs $695, the vendor said from 2120 Industrial Parkway, Silver Spring, Md. 20904.

ABR Introduces Readout Units

NEW YORK — ABR Corp. has introduced a line of computer readout terminals that interface with any RS-232 unit and produce a transcription of data punched on tape.

The units are "video editors" that can be used with ABR's Maxi-Memory units, ABR said.

The readout units start at $1,200. ABR is at 262 Mott St., New York, N.Y. 10012.

Graphics Terminal System Targets Education Market

MAYNARD, Mass. — Digital Equipment Corp. has unveiled a graphics terminal package aimed at the educational marketplace.

The General Imaging Generator and Interpreter (Gigi) is a microprocessor-based, portable "intelligent keyboard" that can be used with user-supplied color or monochrome video monitors, according to the vendor.

Gigi and its associated software are supported under the RSTS/E, VAX/-VMS and Tops-20 operating systems. Gigi is said to extend the capabilities of DEC's interactive educational computer systems based on the PDP-11, VAX-11 and Decsystem-20 computers.

The Decwriter IV Graphics Printer — a microprocessor-driven dot matrix printer — provides hard copy of images from the system's monitor screens.

Gigi is available to educational institutions in "5-packs." Each 5-pack includes five Gigis with associated cables and connectors, one Gigi graphic printer, discount certificates toward additional Gigi units, and a choice of one or two software options.

Educational customers can buy 5-packs at $25,000. Single-unit pricing is available without the educational discount from the firm in Maynard, Mass. 01754.

Terminal-Master System Uses TWX, Telex, Dataphone Nets

N. HOLLYWOOD, Calif. — A communications system that reportedly permits users to utilize TWX, telex and Dataphone networks has been introduced by Terminal Systems, Inc.

Terminal-Master consists of a Teletype Corp. Model 43 KSR printer with a microprocessor that enables it to be used with the three communications systems.

In addition to allowing a single printer to be used for multiple purposes, Terminal-Master is said to handle a number of other protocols.

Designed to contain 4K bytes of buffered storage, the system is expandable to 16K bytes. Terminal-Master, including 4K bytes of memory, leases for $125/mo, including maintenance on a 2-year rental, or sells for $3,100 from 11300 Hartland St., N. Hollywood, Calif. 91605.

Line Diagnostics Tool Offered

RIDGEFIELD, Conn. — A portable data communications diagnostics tool for field technicians is available from Digitech Data Industries, Inc.

The Data Monitor 200 can be used by anyone, regardless of experience level, to diagnose a majority of line problems, the vendor claimed.

Data Monitor 200

The product was designed to interface with the vendor's Encore 100, and all data captured on the 200 can be analyzed by the 100.

The Data Monitor 200 includes monitor, tape recorder and scope and costs $5,000. Digitech is headquartered at 66 Grove St., Ridgefield, Conn. 06877.

Avanti Direct-Connect Unit Debuts

NEWPORT, R.I. — Avanti Communications Corp. has unveiled its 300 Modem Eliminator/Driver, designed to allow direct connection between terminals and computers at distances up to 400 ft.

An internal crystal-controlled oscillator provides operating speeds of 2,400-, 4,800-, 9,600- and 19.2K bit/-sec, all switch-selectable.

The Modem Eliminator/Driver is priced at $360, the vendor said from Aquidneck Industrial Park, Newport, R.I. 02840.

Lee Data Upgrades Terminal Line

MINNEAPOLIS — Lee Data Corp. has expanded the capability of its All-in-One Softprint CRT terminal by adding screen format compatibility with the IBM 3278 Model 3. The All-in-One CRT terminal is used as a component with the Series 300 system, which is compatible with IBM 3274 models, the vendor said.

Lee also announced a 1,920-char. CRT terminal for use on its systems.

A Series 300 system with controller, seven All-in-One CRT terminals and a 120 char./sec printer leases for $738/mo plus maintenance on a three-year lease. The equivalent system with 1,920 char. CRT terminal leases for $661/mo, the vendor said from 10206 Crosstown Circle, Minneapolis, Minn. 55344.

Data Control Adds Short-Haul Sets

DANBURY, Conn. — Data-Control Systems, Inc. has added two short-range data sets to its Access Network product line.

The SR-102 is an asynchronous device that operates at up to 1M-byte data rates over twisted pairs.

The Model SR-202 is synchronous, operating at strap-selectable speeds of 2,400-, 4,800-, 9,600- or 19.2K bit/sec.

The free-standing unit price is $260 for the asynchronous model and $360 for the synchronous model.

Data-Control Systems is located at Commerce Drive, Danbury, Conn. 06810.

Unit Routes Optic Signals

HARRISBURG, Pa. — A fiber-optic splitter/combiner that is said to provide a means of routing one optical signal to or from seven locations is available from AMP, Inc.

Working transmission distances are up to one kilometer for each of the seven legs.

The product costs $130. AMP can be reached through P.O. Box 3608, Harrisburg, Pa. 17105.

Timeplex Offers Options

ROCHELLE PARK, N.J. — Timeplex, Inc. has introduced two firmware options for its Series II Microplexer that add data communications network control and diagnostic capabilities.

The Configurator option allows the user, via a standard CRT terminal, to reconfigure any or all channels in a non-interfering mode, the vendor claimed.

The Extended Diagnostics option allows the user, via the supervisory port of the multiplexer, to initiate diagnostic statements to generate test patterns and loop-backs. It also analyzes data on a per-channel basis, the vendor said.

The Configurator option costs $150 and the Extended Diagnostics option is priced at $100. Timeplex is at 1 Communications Plaza, Rochelle Park, N.J. 07662.

Interactive Systems Adds RF Modem for Coax Nets

ST. PAUL, Minn. — An RF data modem for point-to-point broadband coaxial cable networks has been introduced by the Interactive Systems unit of 3M Co.'s Telcomm Products Division.

The Model 920 modem, designed for half- or full-duplex operation, can be used with other modems, audio modems and video devices on a fully loaded coaxial cable network. When interfaced with intelligent terminals, the 920 can be used for multidrop as well as for point-to-point system applications.

Data rates are 600- to 9,600 bit/sec synchronous and up to 10K bit/sec asynchronous. RS-232C and 20mA current-loop operating modes and communications protocol also are switch selectable.

The price for the Model 920 is $840. More information can be obtained from 3M, Telcomm Products Division, Departemtn TL80-17, P.O. Box 33600, St. Paul, Minn. 55133.

Motorola System Lets Agencies Share Computer

SCHAUMBURG, Ill. — Motorola, Inc. has unveiled its MDS-500 Multiagency Dispatcher Software/Data Communications product, which is designed to allow diverse public agencies to share computer resources.

With the MDS-500, police complaints, fire alarms and other incidents can be handled on an interagency basis between dispatch centers without sacrificing self-government, the vendor claimed.

The minicomputer-based system handles up to six public safety agencies. It is part of a communications system that combines mobile radios, printers and data terminals with software and hardware.

The system costs approximately $170,000 for one agency, the vendor said from 1301 E. Algonquin Rd., Schaumburg, Ill. 60196.

'Good News, Baker. The System Thinks You Should Be Transferred to a Different Climate.'

Nov. 24, 1980

SPECIAL
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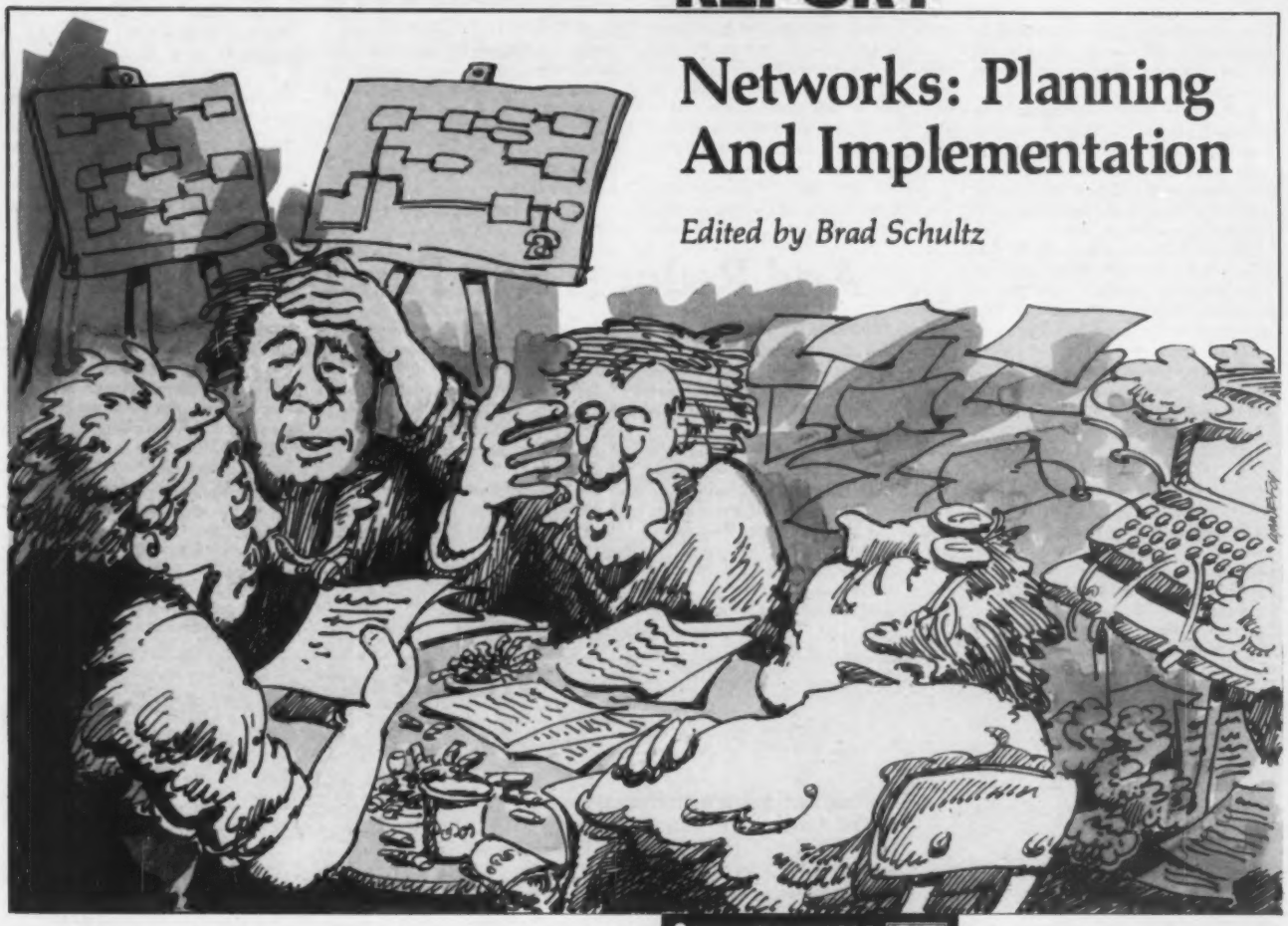
REPORT

Networks: Planning And Implementation

Edited by Brad Schultz



COMPUTERWORLD

Soup-to-Nuts Approach

Planning Tack Starts With Design Concept . . .

By Philip A. Tenkhoff
Special to CW

All too often in the anxiety to get a communications network "up," the implementor decides to omit several aspects of a methodical approach to planning, design and implementation. The result is generally a network capability that falls short of expectations.

This failure to meet expectations can also arise from the lack of clearly defined network objectives and requirements. This omission usually results in a network that may meet some short-term objectives, but may lack the flexibility to achieve long-term goals.

In either event, much wasted time and expenditure can be eliminated by following a well-disciplined approach to the planning and implementation process.

This article briefly summarizes an approach used in a variety of network situations with highly favorable results. It is based upon a logical process that commences with the definition of network objectives and concludes with installation and integration.

The approach recognizes clearly that a successful network is based upon more than the requisite collection of hardware, software and common carrier services. It must possess such other attributes as:

- Responsiveness to requirements.
- Flexibility to accommodate changing requirements.
- Optimized cost/performance.
- Reliability consistent with objectives.
- Adaptability to changing technology.

The approach was divided into 10 phases, and phases 1 through 4 are summarized below. *[A second article presenting phases 5 through 10 begins on this page — Ed.]*

Although the extent to which each phase is followed will depend upon the magnitude and scope of the network, each must be considered and evaluated.

Definition of Objectives

The purpose of Phase 1 is to define clearly the goals and objectives of the network. As a minimum, the following should be addressed specifically and documented:

- Statement of the overall purpose and objectives of the network.
- Statement of the relationship of the network to the total data processing system.
- Assessment of the feasibility of the network.
- Statement of the justification for the network.
- Definition of the scope of the network.
- Identification of organizations to be affected by the network.

Upon completion of definition of objectives, the next step is to define clearly the requirements of the network. The primary purposes of Phase 2, Requirements Analysis, are threefold:

- To validate the objectives and make modifications where appropriate.
- To outline the performance requirements necessary to meet network objectives.
- To establish specific functional and operational requirements for the network.

At the conclusion of this phase, a report should be issued specifically to address:

- Feasibility of achieving stated objectives.
- Scope of the total network.
- Documentation of network requirements (reliability, performance, security, cost, schedules, estimated network traffic, geographic coverage and operational controls).

Current Systems Analysis

Phase 3 — Current Systems Analysis — addresses the systems currently in use. Because the selected network approach must interface with existing systems such as host computers, terminals, communications devices or other networks, it is important early in the study to understand clearly and to document the characteristics and constraints imposed by these existing systems.

Specific objectives of this phase are:

- Documentation of existing systems (hardware components, available software, performance, reliability and functional characteristics).
- Analysis of characteristics and constraints of currently utilized systems.
- Review of any previous network studies that have been made.

Evaluation and Planning

The documented results of the requirements analysis and current systems analysis phases provide the basis for Phase 4, Evaluation and Planning. The initial task effort is to formulate conceptual network designs that appear to be responsive to network requirements.

Such conceptual designs could include, for example:

- Design and implementation of a private network.
- Use of available "value-added" network services.
- Use of common and specialized carrier services.
- Purchase/lease of a private network.
- Network sharing.
- Combinations of the above.

These conceptual designs provide a clearer perspective of the magnitude of the network project — including gross cost and time estimates.

Three distinct tasks are required as part of this phase. The first such task is to produce gross estimates of the costs and potential benefits of alternative network designs. Categories of costs to be estimated include those associated with software development, facilities, communications services, communications hardware devices, personnel, maintenance and common carrier services.

The second task involves the development of implementation plans for primary and alternate network design approaches. These plans include tentative schedules and labor requirements.

The third task involves describing each proposed design. This description includes rationale for design concept, constraints and responsiveness to requirements.

. . . And Reduces It to Functional Model

By Philip A. Tenkhoff
Special to CW

The network General Design phase results in a high-level functional and performance design of the total network.

The primary purpose of Phase 5 is to reduce the overall conceptual design produced in Phase 4 to a definitive description of the system. Upon completion of the general design, the following are documented:

- General description and diagram of the network.
- General description of the network architecture.
- Definition of all hardware and communications service components.
- Narrative of network functions.
- Network performance capabilities.
- Network reliability capabilities.
- Flexibility for future growth.
- Interface requirements.
- Traffic volume capabilities.
- Results of trade-off studies.
- Maintenance approach.
- Performance monitoring capabilities.
- Human engineering.
- Operational control.
- Hours of operation.
- Recommendations.

Upon completion of the general design, specifications for the procurement of hardware and software components are produced in Phase 6. The scope and amount of detail for these specifications depend to a degree upon the complexity of the network.

Simple networks, using standard "off-the-shelf" components, do not require the same level of detail as the more complex networks.

Typical components requiring specifications are modems, terminals, multiplexers, concentrators and communications software.

(Continued on SR/8)

Inside

Planning Local-Area Nets Harder Than It Looks

By Ivan T. Frisch
Special to CW

Beware! Planning local-area communications networks (LACN) may look too easy. Indeed, because the networks usually use coaxial cable or optical fiber, it appears that there is bandwidth to burn.

Because the systems are confined to a few local buildings and, hence, propagation times are about 10 microseconds, response time would seem to be almost instantaneous. Because of a protected communications environment, error rates of less than one error per 100 million bits are easily attained.

Therefore, you may be tempted to throw together some cable with a few microprocessors and build a network, or hastily buy the best looking off-the-shelf system that meets deadlines. However, it may be that, inspite of all its mind-boggling capacity, the network you wind up with is missing precisely the capability that is vital to you or is lacking the flexibility to be expanded to your needs.

Essential Steps

Indeed, disaster may lurk in skipping any of these classical planning steps:

Step 1. Determine applications to be supported, for example, office automation.

Step 2. Formulate functional requirements such as electronic mail, file transfer and interactive computing.

Step 3. Specify operating requirements, such as response time, reliability and so on.

Step 4. Categorize LACN architectures.

Step 5. Formulate tradeoffs among LACN features based upon your needs and priorities.

Step 6. Design and select system.

To illustrate my point, let me give you an example in terms of three important LACNs, each of which has many excellent features. They are Ethernet of Xerox Corp., Hyperbus of Network Systems Corp. and Mitrenet of Mitre Corp.

My purpose is not to grade these systems, but just to demonstrate the steps you must take to compare their ability to meet your requirements. Many variations of the three systems exist or are being developed. Therefore, to provide a framework for this discussion, let me very briefly describe the high-level features of one version of each of the systems.

Ethernet is a coaxial cable-based, bus-oriented communication system, providing a raw bandwidth of 3M bit/sec, interconnecting word processors, minicomputers or intelligent terminals, and spanning a linear distance of about 1 kilometer. The overall structure of this system is shown in Figure 1a.

The Ethernet controller resides in the host minicomputer or intelligent terminal, and is connected to the transceiver by a twisted-pair cable. The controller is implemented partially in hardware, microcode, and in software. Together, they perform all the intranet data transfer functions. The basic unit of data to be exchanged between two Ethernet controllers is called a "packet." The transceiver transmits and receives signals on the cable, and detects collisions among "contending" packets.

Network Systems Corp. is currently developing a new coaxial, cable-based, commercial LACN called Hyperbus designed for the interconnection of terminals or computers of different vendors through devices generally known as Bus Interface Units (BIU).

The bus operates at 1M bit/sec and provides for multidrops over distances of several thousand feet. Figure 1b illustrates the configuration of a Hyperbus. The BIUs contain microprocessors and data buffers and various BIU models implement interfaces to different families of logical or physical units.

The Mitre Corp. has also implemented a coaxial cable-based, local area network, using an Ethernet-like contention discipline. This system employs microprocessor-based nodes as the interfaces for subscriber devices. The Mitre cable bus system uses two parallel channels — one outbound and one inbound — as shown in Figure 1c. The Bus Interface Unit (BIU) contains modems and digital logic which support the network protocol and interface the subscriber's equipment. Standard cable television (CATV) components, such as cables, taps, splitters and amplifiers are used for signal distribution. The Mitrenet operates at 1.2M bit/sec.

Of course, at this level of description there is certainly no way to say which system is better — so let's look at some

(Continued on SR/4)

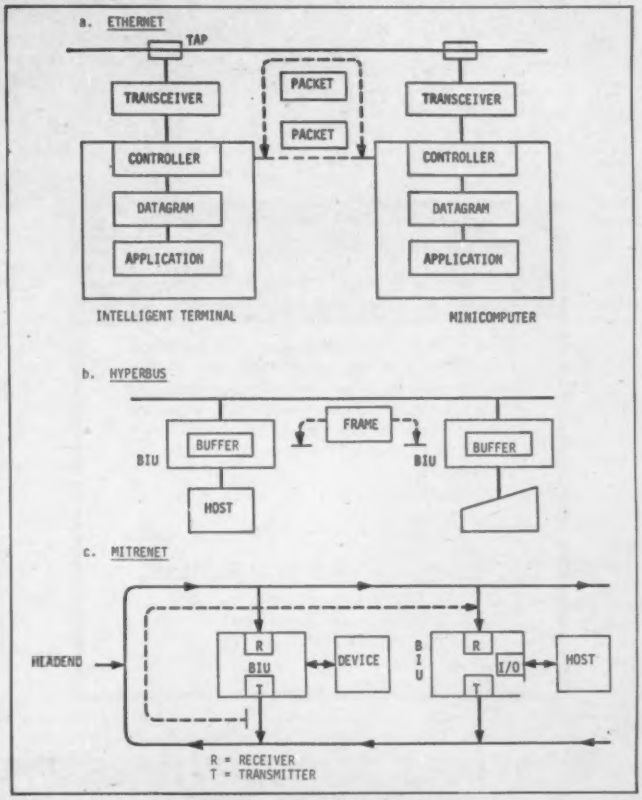


Figure 1: Network Architecture

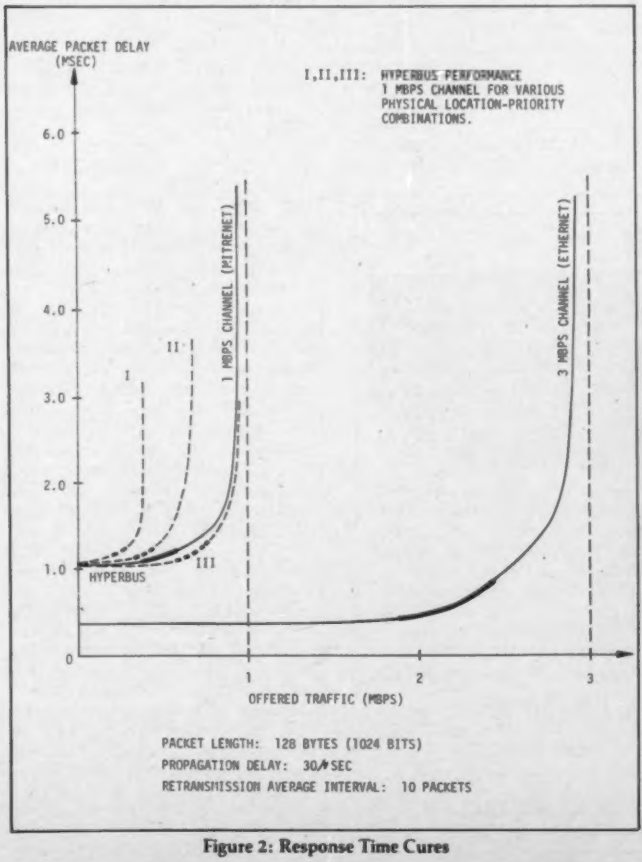


Figure 2: Response Time Cures

Disaster Lurks in Shortcuts to Local-Area Nets

(Continued from SR/3)

applications. It is possible that you have, or soon will have, a terminal in your office to do some interactive computing or editing. In these cases you would like to be able to send a few thousand bits in no more than 10 seconds.

In addition, you or another user in your operation may want to use the same LACN to transfer the contents of tapes between different tape drives or from archive in one location, to a mainframe in the same or another building. This is a common requirement in billing and accounting operations, computer-aided design and many other applications. It is not uncommon at all for files of 100 million bits to be transferred.

The key here is not a response time of only 10 seconds; a couple of minutes might be acceptable. Rather, the important point is that these transfers must not tie up the system. Of course, it would be ideal if such bulk transfers could be accomplished in a few seconds without significant cost penalty.

LACN Categories

- **Topology: Star, loop, bus, tree, mesh.**
- **Transmission Medium: Twisted pairs, coaxial cable, optical fiber, radio links, optical links, building power lines.**
- **Transmission Mode: Analog baseband, digital baseband, radio frequency (RF) modulated.**
- **Access Protocol: Dedicated (time division multiplexing, frequency division multiplexing), centrally controlled (circuit switching, polling), distributed control (random-access, carrier-sense multiple-access), hybrid schemes.**
- **Speed (Bandwidth): Low-speed (less than 256K bit/sec), medium-speed (256K- to 10M bit/sec), high-speed (above 10M bit/sec).**
- **Standards and Compatibility: Variety of terminals and protocols which can be interfaced, ability to convert protocols, ability to interface to other networks through "gateways."**
- **Higher Level Protocols: Availability of services such as directories, network management procedures and security.**

How do our three systems fare under these requirements? Examining the curves in Figure 2, we can get some answers. The curves show average response time per packet in milliseconds as a function of total traffic offered by all users.

Each system is well utilized if it is operated in the knee of each curve because then we have many users with reasonably low delays. If traffic is increased beyond the knee, then delays become unbounded, i.e., you will go to sleep before you get your response.

We see that Ethernet can handle the most interactive traffic. Thus, at 2M bit/second of offered traffic, if each input is about 1,000 bits, we can handle 2,000 simultaneous users.

Hyperbus exhibits strange behavior in that its performance depends upon the actual configuration of users on the system. In any case, for interactive requirements, all three systems give impressive response times, in the order of milliseconds, for large numbers of users.

The Hyperbus seems to be poorest, and would fare even worse if on Curve I we were to look at peak delays instead of average delays.

Now let's look at a second requirement for file transfer. If you need to transfer 100 million bits in, say, 10 seconds, the data rate (even ignoring headers, protocols and so on) would be 10M bit/sec. That takes you into the unbounded part of the curves; even worse, it floods the system so no one else can use it.

Thus, none of the three systems is adequate in the configurations I have described. However, it turns out that Mitrenet can be easily modified in architecture so that we can dedicate enough bandwidth, say 6 MHz, to be able to give you 10M bit/sec of data transferred.

At that speed you can get 10-second response time for your file *without affecting the interactive traffic.*

Three Questions

Knowing all this beforehand, you would then have selected and tailored your system to your requirements. But you see now why it is not so easy. I still haven't explained enough about the systems for you to understand the answers to these questions:

Question 1: Why does Hyperbus performance depend upon terminal arrangement?

Question 2: Why are the systems ordered as they are in Figure 2?

Question 3: Why is it easy in this case to modify Mitrenet for bulk transfers and not the other two?

Let me explain just a little bit more about the systems to enable you to understand the answers. First of all, to avoid comparing lists of random features, it is useful to classify LACN architectures by several broad categories, as in Table 1.

These categories encompass current architectures and can easily accommodate new developments. The categories are generally highly correlated. For example, twisted-pair cable will often dictate low- to medium-speed networks, and a mesh system often uses distributed control.

Of course, the lines between each choice are fuzzy, and the categories are certainly not unique. All of the categories and items in Table 1 are important for different applications.

However, for the purpose of answering the questions I have posed, it is sufficient to briefly address just two items: transmission mode and access protocol. Let's look at transmission mode first.

In Ethernet and Hyperbus, data is transmitted at baseband (i.e., not modulated into a carrier). On the other hand, the Mitrenet employs Radio Frequency (RF) transmission, whereby data is modulated onto a carrier frequency in a standard CATV 6-MHz band between 3- and 300 MHz before being transmitted.

This is why, in answer to Question 3, it is easy on Mitrenet to add another 6-MHz channel for file transfer. Indeed, it is also easy to piggyback video and separate voice channels.

However, recognize that there are no unmixed blessings. RF components are quite expensive compared to baseband transmission (a factor of approximately 3:1).

Therefore, for low data rates (up to 3M bit/sec) and short cable length ap-

(Continued on SR/6)

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No Easy Shortcuts to Planning Local-Area Nets

(Continued from SR/4)

plications (less than 1 kilometer), baseband designs are quite appropriate. For applications which require high bandwidth or simultaneous use of the cable for purposes other than data exchange (such as voice and video), the RF broadband approach is clearly a better choice.

Access Protocols

To answer the two other questions, I will briefly examine access protocols. Ethernet and Mitrenet employ similar access methods known as carrier-sense-multiple-access-collision detection (CSMA/CD), allowing each BIU to access the cable on a contention basis.

This scheme involves three different operations: The *carrier-sense* (also known as "listen before talk") operation means that each BIU will monitor the channel prior to transmission. If carrier is sensed on the bus, the BIU will be restrained from transmitting until the channel is free again.

The second operation is *collision detection*. Each transmitting station aborts the transmission immediately if destructive interference due to collision is detected.

The final operation is *back-off*. When collision is detected, the colliding BIUs wait or "back-off" for random periods of time before retransmitting the frame. The resulting CSMA/CD access scheme yields very high channel utilization (in excess of 90% of channel capacity) and low access delay during light traffic.

The access protocol of Hyperbus is quite different from the other two. The Hyperbus employs two modes of operation: free flow mode and priority mode. During the free flow mode, the BIU is free to transmit when the channel is idle. Collisions in the free flow mode are detected by the absence of an acknowledgment.

Once any BIU has transmitted during the free flow mode, the system will enter the priority mode, whereby the cable is reserved for a period of time after each transmission to allow acknowledgment. The scheme allows a certain number of priority classes and, for equal priority traffic, gives preferential treatment to BIUs depending upon their relative position on the cable.

If there is a collision in the free flow mode, the acknowledgment will not be present. All BIUs will enter the operational priority mode to resolve the contention. This access scheme is somewhat complex for the interactive applications in this example. It prioritizes access to the cable and allows marginal improvement of channel utilization during heavy traffic.

However, such capabilities are attainable only through strict control of each BIUs location on the bus; otherwise, the performance can deteriorate substantially. Therefore, the biggest disadvantage of this scheme is its inflexibility of system configuration.

This answers the first question and explains why, with different terminal configurations, we get different performances for Hyperbus in Figure 2.

Finally, in answer to the second question, we see that Ethernet and Mitrenet both are CSMA and that for our example of interactive traffic, their performance is at least as good as for Hyperbus and that the performance of Ethernet is roughly three times as good as Mitrenet simply because the data rate based upon bandwidth allocation is roughly three times as high.

I started out trying to make a very simple point: there are very significant tradeoffs in planning an LACN. To do this I have had to drag you through some technical details that should ordinarily be transparent to you as a user and, of course, once your system is implemented you will not have to worry about the details of access methods, etc.

However, in the planning stage, it is important to proceed through all six steps indicated at the beginning and make sure that your system is specified to meet your requirements.

Obviously, there are many other features of LACNs I have not addressed in this discussion. For example, the item on standards and compatibility in Table 1 is critical to all potential LACN users. Regardless of how well you address the issues of access methods, the system is useless if it will not handle your protocols and equipment interfaces.

Furthermore, standards have certainly not been agreed upon so that you must assess your capability of adding new protocols and equipment and the costs you will incur.

The small example I have given you should help to illustrate the type of considerations and methodology that you should use to evaluate all your requirements in planning a Local Area Communication Network.

Frisch is senior vice president of Network Analysis Corp., located at 130 Steamboat Road, Great Neck, N.Y. 11024.

'Well, Yes, I Got a Handle on Everything.'

To Ensure Economic Security

Decentralization Vital to Library Networking

By Cynthia Durance
And Mazharul Islam
Special to CW

Library networking will be economically insecure and uncertain unless the user ensures sufficient decentralization and openness of systems and services to allow widespread resource sharing and maximum resource utilization.

For library networks and systems to be open to one another as well as to related systems in the information sector, it is essential that existing library networks migrate systematically to a layered or modular structure and that new networks conform to an architecture requiring clear differentiation and a strict hierarchy of all network functions.

Only a network conforming to such a modular architecture and a standardized protocol system can be hospitable to openness and decentralization. Only in this way can library application-oriented networks derive the maximum technical and economic benefits from the rapidly growing data networks in industrialized countries.

Fortunately for library networking, international standards now exist and are being progressively implemented by concerned parties at the first three levels of the "open systems architecture." It also appears likely that standardization up to the (end-to-end) transport level will be achieved before long.

Basic Objective

The basic objective of all library networks is to provide a mechanism for shared use of dispersed, costly and scarce library resources, such as collections, data, services and systems, by the widest possible circle of users.

Such a network is crucially important in a country like Canada, where library resources are not only relatively scarce and scattered, but must be shared by a relatively small population of 24 million dispersed over the second largest country on earth.

These resources are not only dispersed geographically, but are also controlled by many jurisdictions both public and private. Furthermore, automated library systems that now exist in Canada differ considerably from one another in type, scope and the extent of technical resources they command.

At one end of this spectrum are stand-alone minicomputer-based systems serving individual libraries; at the other end are large systems equipped with dedicated mainframe computers serving tens or hundreds of libraries and handling data bases of a million or more bibliographic records. The Utlas system of the University of Toronto and the Dobis system of the National Library/Canada Institute for Scientific and Technical Information are two prime examples of this latter kind.

In such an environment resource sharing, though clearly indispensable, can only be effected through voluntary cooperation.

Data Interchange

The cornerstone of all cooperative or library network-based operations and services is the ability of libraries to interchange and share bibliographic data promptly and economically — data that identifies, locates and describes documents and contents of documents held in various libraries and information centers in the country.

In the past and to a large extent at present, interchange of bibliographic data has been slow and labor-intensive. With the increasing automation of library operations and the growth of modern data communications facilities, library networking has been moving steadily towards ever-increasing reliance on computer and communications technologies.

Today, an immense quantity of bibliographic data exists in machine-readable form, but interchange and shared use in a nationwide network environment raises formidable problems.

Communications Roadblocks

The roots of these problems are complex, but can be traced largely to the isolated efforts towards library automation and networking. As a result, we now have a variety of closed networks incapable of communicating with one another without considerable effort and commensurate expense.

In this environment, the end user invariably loses because there is no effective mechanism to support his access to the library and information resources held independently by many systems or networks in the country.

The user is only slightly better off if locked, as is often the case, in one of the closed networks while lacking the freedom and the necessary technical means to access resources that belong to other networks or to no network at all. The owners of library resources and closed networks also lose because their scarce and expensive resources are largely underutilized.

The underfinancing and the underutilization of library resources, particularly of the costly automated variety, is too well known to need elaboration here. Suffice it to mention that the deeper roots of this problem have so

(Continued on SR/8)

Decentralization Key to Library Net

(Continued from SR/7)

far been generally ignored; remedies proposed called mostly for bigger or more closed networks, more ad hoc interconnections and more public subsidies.

Fresh Approach

Now the National Library of Canada has come forward with what is undoubtedly a fresh approach to networking in Canada and may well prove to be the most fruitful framework for all network development and implementation.

The key elements in the National Library's approach to library networking in Canada are decentralization and openness. These conecpts are by no means revolutionary in themselves, but in the context of the present environment and future prospects they have powerful implications.

Decentralization duly recognizes the geographic, sectoral, jurisdictional and organizational boundaries of library and information resources of the country. Openness encourages and makes possible multisystem, multinetwork interactions, without which universal accessibility of all systems and resources to all users can never be assured.

Only a decentralized open network can provide the required mechanism for widespread resource sharing and maximum resource utilization, without which the economic future of library-based systems and services must remain insecure and uncertain.

The National Library of Canada did not adopt this strategy overnight; it has been studying the problem of library network building in Canada and elsewhere quite intensively since 1972.

End to Isolation

In a forthcoming document entitled "The Context of Interconnection for a Nationwide Bibliographic Network," the National Library reviews the broader context of bibliographic networking and concludes that *it is no longer desirable or indeed possible to view library-based systems in isolation and in disregard of profound technological and structural changes now taking place in other components of the information sector.*

Historically, the impetus for bibliographic networking arose from the internal needs of libraries for economy and efficient use of scarce resources. As a result, libraries tended to regard bibliographic data interchange as internal to the library world involving little or no direct interaction with the outside.

Such a view is no longer tenable. Other segments of the information sector, such as information dissemination industry, publishers and the book trade, have also acquired an interest and expertise in utilizing automated bibliographic data systems.

Library systems are increasingly undertaking machine-based business transactions with these and other segments of the information sector. Characteristically, the machine-readable data used by nonlibrary segments differs structurally and quantitatively from that generated by library systems.

There is, nonetheless, no insurmountable reason why library-created data cannot be communicated over one or more of the message delivery systems being utilized or developed by other segments of the information sector, provided some additional efforts are undertaken to make the structural differences transparent to the users and to the communication system.

Maximized Access

By integrating with other segments of the information sector, a library-oriented data interchange network not only ensures its economic viability but, more importantly, maximizes access to bibliographic data by the widest possible circle of information seekers.

In the past, library networks were designed as closed systems built upon centralized processing power and dedicated communication lines leased from common carriers. The architecture of such networks, being application- and hardware-dependent, often lacked the necessary separation between purely communications-oriented functions and those concerned with the processing of application level tasks.

Technical incompatibilities would generally inhibit development of interconnection with other networks and outside systems.

As a result, closed library networks tend to be characterized by inflexibility, high cost of services, underutilization of resources, a captive clientele and highly centralized administration and control. The goal of universal access to the library and information resources of the country will be unattainable so long as these resources remain locked in numerous closed networks unable to communicate and cooperate with one another.

The National Library's position is thus essentially that library systems not only have to be "open" to one another, but also to related systems in the rest of the information sector. When there were only a few systems to interconnect, interconnection via ad hoc, bilateral and usually nonstandard procedures posed no insurmountable problems.

As the number and variety of systems that need to be interconnected increase, such an approach is clearly unworkable. It is at this point that the issue of networking through open systems interconnection assumes a magnitude of central importance.

Durance is director of the National Library of Canada's National Library Network Project, where Islam serves as network liaison officer, at 395 Wellington, Ottawa, Ont., Canada K1A 0N4.

Conceptual Network Design Reduced to Functional Model

(Continued from SR/2)

For each component, the specifications should be of sufficient detail to ensure the desired functional, reliability and performance parameters of the network. Such specifications should be sufficiently clear that any qualified vendor could readily respond.

Design

The detailed design provides the next level of detail to the general design discussed in Phase 5. However, system components will now have been selected and can be integrated into the overall design. Some aspects of the detailed design developed in Phase 7 include:

- Specification of all circuits.
- Detailed network configuration.
- Test equipment requirements.
- Maintenance plan.
- Personnel plan.
- Documentation plan.

Implementation Plan

An implementation plan — Phase 8 — needs to be prepared including:

- Facilities requirements and orders.
- Circuit requirements and orders.
- Hardware requirements and orders.
- Software requirements and implementation.
- Personnel acquisition and training.
- Operating procedures.

This plan is then used as the basis for installation of the network.

Following the adoption of the implementation plan, a test plan should be prepared in Phase 9. Components of the test plan include:

- Vendor quality assurance requirements.
- Hardware and software component acceptance tests.
- System level testing.
- Pilot operation.
- On-line maintenance testing.

Integration and Installation is the tenth and final phase of the development and implementation of a network. The end result is a network integrated with other systems, such as existing host computers and terminals, and one that satisfies the design objectives and functional requirements.

Major phases of integration and installation include:

- Facility preparation and acceptance.
- Hardware installation and integration.
- Hardware acceptance.
- Software integration.
- Terminal(s) integration.
- Host computer(s) integration.
- Network documentation.
- Network acceptance.

At this stage, the network is installed and operating; continued successful operation requires a rigorous program of preventive maintenance, personnel training, fault diagnosis and general management attention.

Tenkhoff is president of Network Communications International, located at 2639 Parkmont Court, Olympia, Wash. 98502.

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X.25 Nets No Cure-All for Intervendor System

By Tony Russo
Special to CW

Be careful not to view X.25 networks as a cure-all for intervendor communication. X.25 does not guarantee that X.25-compatible devices (even from the same vendors) are compatible with each other.

X.25 is a recommendation of the Consultative Committee on International Telegraph and Telephone (CCITT). Based in Geneva, Switzerland, CCITT is a standards-making body composed primarily of European, government-owned postal, telegraph and telephone companies (PTT), but also including other interested government-sponsored parties from around the world.

While CCITT creates communication standards, it has no authority to impose them on anyone. Hence, the "standards" coming out of CCITT are called recommendations rather than standards.

There are well over a hundred of the recommendations from CCITT that describe interfaces between all types of data communications equipment including things like voltage and signal levels, connection configurations and protocol definitions.

In particular, Recommendation X.25 only defines the *interface* to a public packet-switching network. It does not attempt to describe the internal workings of the network. This is left up to the network designers so long as the network has a well-defined user interface.

In other words, X.25 only specifies the interface between a user's data terminal equipment, which can be a terminal computer or other electronic device, and an X.25 network data circuit-terminal equipment, which is simply the physical port into the X.25 network (see Figure 1).

The X.25 standard is actually only a part of a layered communications architecture — network definition. One model of a communications architecture is the International Standards Organization (ISO) Open Systems Interconnect.

This architecture is an international attempt to define the functions of each layer and the interface between layers for both users and carriers [CW, Oct. 27].

In any layered architecture, the total communications capability is broken into distinct "layers" where each layer performs a specific function required to support the high-level features "seen" by the user.

Each functional layer is tightly defined, as is the interface between layers, or levels. In the Open Systems Interconnect model, only three have so far been defined for public packet-switching networks, commonly referred to as X.25 networks.

Level by Level

As seen in the CCITT packet-switching architecture in Figure 2, Level I is the electrical interface level that describes the voltage levels and the pin configurations and signal definitions that are needed to physically connect two devices together successfully.

Level II outlines the link-level protocol that enables a user's data buffer of ones and zeros to be transferred between two devices.

Error checking, bit sequencing and retransmission of buffers in error are all functions described by this level. Note that this function is only concerned with correctly moving a set of ones and zeros or what they mean.

These link-level protocols are often simply called "proto-

(Continued on SR/16)

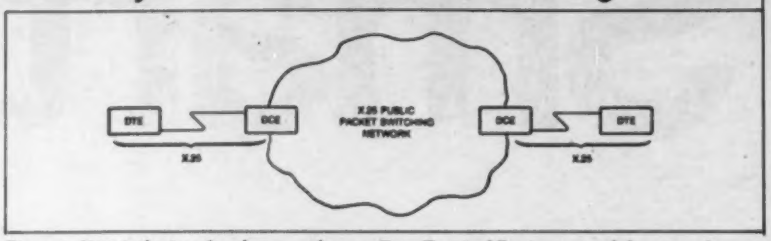


Figure 1. X.25 is the interface between the user Data Terminal Equipment and the network ports. The protocol does not attempt to describe the inner workings of the network.

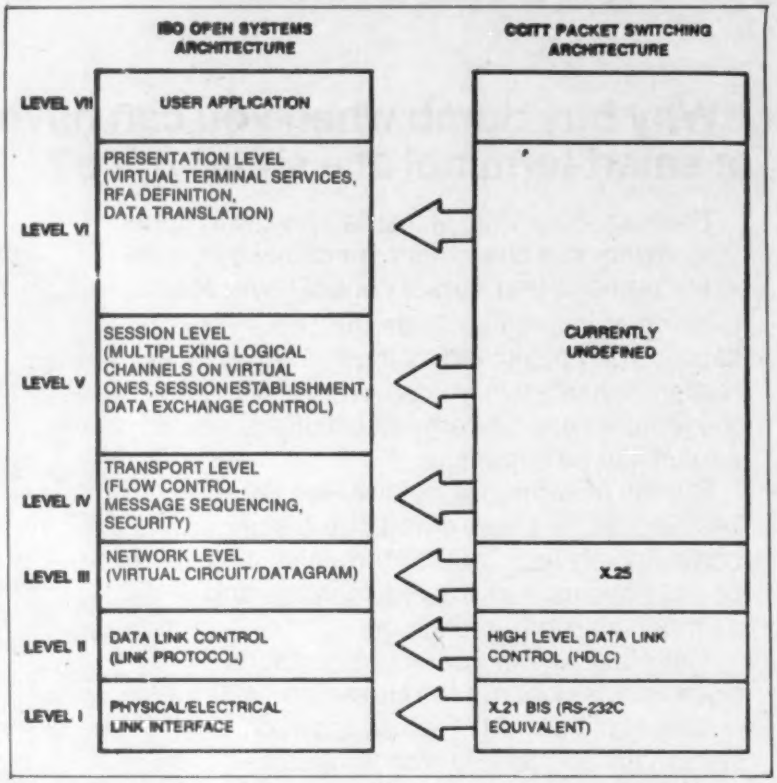


Figure 2. The relation of CCITT-recommended standards to ISO open systems architecture is shown above.

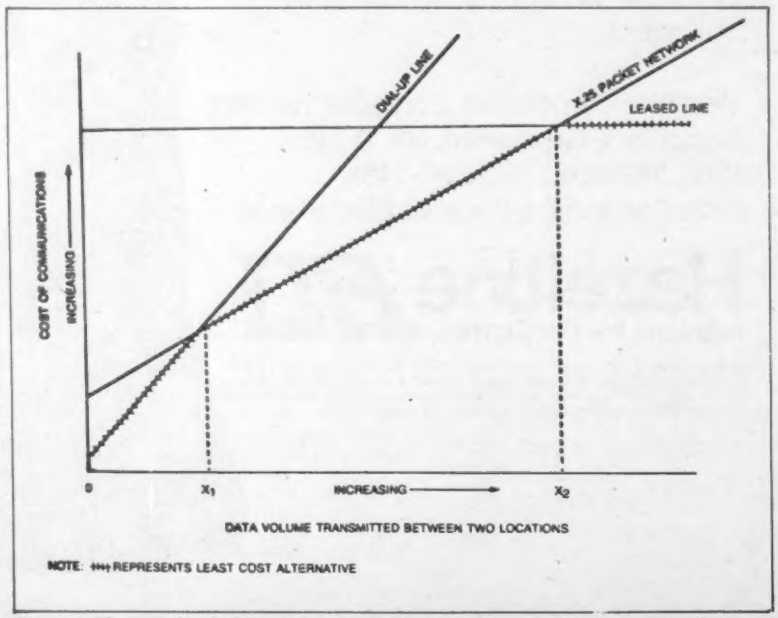


Figure 3. The corss-hatched line is least-cost alternative among dial-up communications lines, packet networks and leased lines.

Entry-Level Explanation

Mystery of X.25 Packet Network Cracked

By Tony Russo
Special to CW

One of the hottest topics in the computer business nowadays is the sometimes mystical X.25 network. This article attempts to clear up a number of commonly held misunderstandings about X.25 networks, while also providing an entry-level explanation for those people with little or no prior knowledge in this area.

Since the X.25 standard defines the interface between a user and public packet-switching network, it is appropriate to discuss packet-switching networks in general before attempting to explain the standard.

Packet-switching networks offer lower cost data communications because their toll charges accrue based on how much data a user sends across the network (plus a flat, monthly connect fee).

Charges are not related to connect time or the distance between points as is true for dial-up or private networks.

Flat Rate

The telephone system, for example, charges customers a flat rate for a leased telephone line, or a time and distance rate for dial-up circuits, regardless of the amount of information the user actually transmits across the line.

This means that if you use telephone links to connect two computers, you pay the same rate whether or not you send any data. With packet-switching networks, you only pay for what you send.

The three most important benefits are:

- Lower cost of data transfer.
- Increased network reliability.
- A well-defined standard user interface, (i.e., X.25).

To understand how packet-switching networks can charge less money to provide the same data transport service as existing public networks — i.e., the telephone companies and their spinoffs — requires a little insight into how the packet-switching networks operate.

The first important thing to understand is that all information passing over a packet-switching network must be broken up into fixed-length "packets."

Since this packetizing function is not a user-level task, the length of these packets is unimportant to this discussion, and may in fact vary from network to network.

Even though a user may wish to send large, contiguous blocks of data, these large blocks must be broken down into smaller chunks (packets) to be efficiently transported. This packetizing requirement is due to the fundamental difference in packet-switching network operation.

In today's public networks, a user "monopolizes" a physical connection between source and destination. This is the cause for toll charges being keyed to circuit usage rather than data quantity. For example, in a leased circuit, only the users at each end of the link have access to the circuit.

Similarly, in a dial-up connection, once the connection is made, only the two connected parties can use the physical wires connecting them together.

In these cases, the parties involved must pay for the entire cost of their physical circuit for the duration of their exclusive use.

No Restricted Access

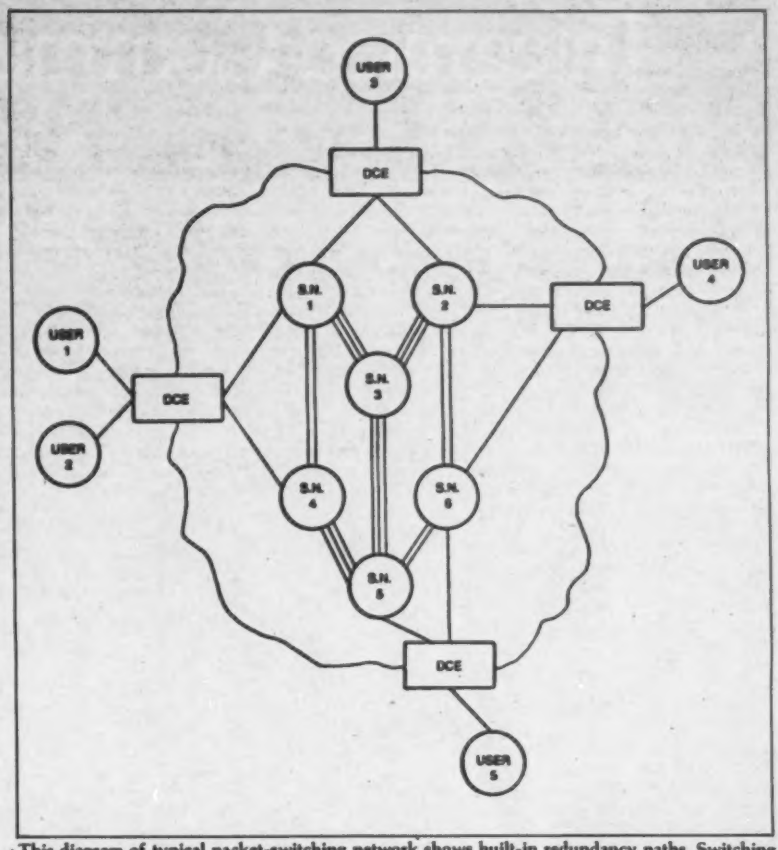
In packet-switching networks, nobody has restricted access to any physical assets. By not assigning physical assets to users, the network can multiplex many users' packets over the same wires.

And since the active path is composed of multiple short segments, a single packet never occupies the entire length of circuit from source to destination.

The network can even go so far as to send your packets over multiple physical circuits as it attempts to maximize the use of its transmission facilities. This shared use of facilities is the basis for the cost reductions and the reason for the name "packet-switching network."

Note that how this packet switching is done by the network is also unimportant to the user, just as the telephone

(Continued on SR/14)



This diagram of typical packet-switching network shows built-in redundancy paths. Switching Nodes (SN) are multiply interconnected to each other and to the Data Circuit-Terminating Equipment (DCE) ports into the network. Many routes are thus open to any given packet of data.

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X.25 Packet Net Mystery Solved

(Continued from SR/11)

company switching algorithms are unimportant to users as long as their calls go through. Different packet-switching networks will undoubtedly perform this function in different ways.

Network Reliability

The second benefit of packet-switching networks — increased network reliability — is a result of the built-in redundancy provided by the basic network structure (see Figure 1 on SR/11).

Typical packet-switching networks are made up of Data Circuit Terminating Equipment (DCE), which are the ports into the network and provide the user interface, plus multiple switching nodes that forward packets around the network.

The high-speed interconnections between DCEs and switching nodes and between pairs of switching nodes can be of any type including telephone system facilities, microwave channels and satellite links.

As shown in the figure on Special Report/11, switching nodes are usually connected to many other switching nodes by sets of redundant links. Since DCEs are also connected to multiple switching nodes, multiple physical paths exist between all DCEs in the network.

When a link or switching node fails, the network reroutes the data from that path to another circuit, thereby maintaining continuity of service. Some very sophisticated networks can even distribute data flow from heavily used links to underutilized ones to permit maximum use of the network facilities.

This capability is called "load balancing." In any event, users benefit from this network redundancy by having higher availability of the communications service.

The third major benefit to packet-switching networks is that there is a standard user interface (X.25) that has been developed by the common carriers that will provide the transmission services rather than by computer vendors who provide the user equipment.

This means that vendors will no longer be able to impose their own protocols and network architectures, as is the case today. (Hewlett-Packard Co.'s DS/1000-IV, IBM's Systems Network Architecture and Digital Equipment Corp.'s Decnet are examples of vendor-specific architectures.)

Users of packet-switched networks will find it easier to employ equipment from multiple vendors. But compatibility with X.25 networks does not in itself guarantee that two pieces of equipment can communicate with each other.

Although X.25 networks will eliminate many of the problems with interconnectability, it will by no means eliminate them all.

Russo is product manager of network products for Hewlett-Packard Co., located at 1501 Page Mill Road, Palo Alto, Calif. 94304.

'Go Ahead and Sue! It's Your Computer's Word Against Ours!'

Analysis by Analogy

Net Planning Like Engineer's Product Flow Plan

By Christine Leja
Special to CW

Planning a network closely resembles an engineer's product-flow plan. Where a manufacturing engineer would design a shop floor-plan with the idea of assembling a given product line, the network designer would plan on the basis of how particular data flows in the network system.

The analogy between a shop floor-plan and a network closely fits from the conception of an idea to the finished product rolling off the assembly line or bouncing off the data communications line.

A product engineer takes his product design and builds a prototype. As a manufacturing engineer is constructing the die that will produce the samples, the engineer more than likely is gathering information about how the product is being built, how the die is modified from the original design, and noting the constraints about the construction of the die.

As the samples are tested, modifications may be required for durability and applicability. Once the samples meet specifications, design work begins on the shop floor-plan and product-flow through the assembly area.

The shop floor-plan not only includes the physical layout of equipment, but also the flow of the product being built from one area to another, from materials gathering to the shipping dock.

Network Design

A network is designed in a similar fashion. For example, suppose production control is to be facilitated by means of a DP network. The product assembly is controlled via DP, spans several buildings, has a large fluctuation in volume and contains certain options that can be omitted to shorten assembly depending on a customer's requirements.

Prior to designing the network, the systems analyst must first design the nuts and bolts of a computerized production control system incorporating all these constraints and assuming some given network.

Just as an engineer produces samples, so too the systems analyst must show that his production control system, the system design and programs, can fit the requirements of applicability, durability in growth and timely response from one assembly stage to the next. Given a viable design and the equipment to be used, a network can be planned.

Referring back to the engineer's shop floor-plan, the physical placement of equipment, materials and personnel, and the factory layout itself limit and sometimes predetermine the flow of assembly from one stage to the next. In the same way, network design has constraints placed upon it.

The type of data to be analyzed, the physical staging of assemblies, feedback requirements, option requirements at given assembly stages, the time factor involved, equipment currently owned and/or selected for this function, monetary constraints and so on — *all* limit the network design that is developed.

Here too, testing occurs. Does the network design fulfill the requirements given it? Can the network handle a given volume efficiently and accurately? Can the network handle growth and expansion? What happens if one aspect of the network fails? What if one phase of the network is eliminated to affect changes in the production control system? How will the network design respond to these and other "what if" conditions?

Once these questions have been posed and the network adapted to fit these necessary requirements, implementation can proceed. However, the likelihood that some modification can and probably will take place during this phase must be kept in mind.

Testing of the network design will again produce modification — hopefully only minor. It is here that everything comes together. The production control system is again tested, this time under the network design.

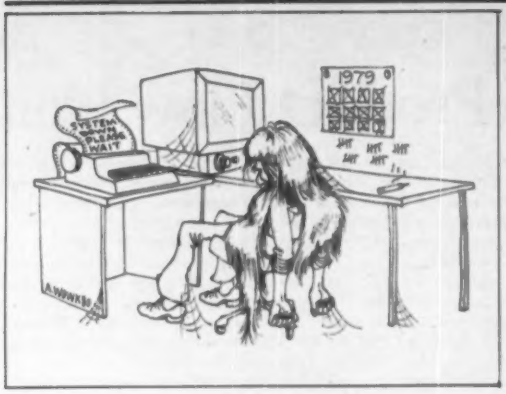
How do the two interconnect? Are modifications required either for the production control system or for the network design or for both? Has the resulting system produced an applicable, viable and durable system?

The engineering approach to implementation has proved itself with time, but as with any engineering assembly system, maintenance is necessary for the product to continue out the door on time and with a satisfactory profitability margin. The network system too must have its maintenance and show a satisfactory profitability picture.

The approach, then, to a network design should be structured from bottom to top, from the system design of programs for a given function to a network design that will handle the system and perhaps other systems within the same network.

Implementation of one system function at a time within a network design will ensure an orderly implementation and testing of a network.

Leja is vice-president of Le Com Enterprises, Inc., whose address is Box 346, Winfield, Ill. 60190.



Nets Based on X.25 No Cure-All

(Continued from SR/10)

cols" and include binary synchronous, high-level data link control and synchronous data link control.

Level III is primarily concerned with the tasks required to establish the communication path. It describes the types and sequence of user messages to the network to create a link to another user and to destroy the link when through. Level III does not attempt to define any type of user request nor perform any routing or control functions internal to the network operation.

Taken Together

Together, Levels I through III only enable users to connect to X.25 networks, to establish communications paths through the network and to transfer buffers of data from one location to another.

The standards for user-level services, such as remote file access and virtual terminals, are located in the higher and as-yet-undefined levels.

For this reason, it is impossible to assume that simply because two devices are X.25-compatible they can communicate with each other in any useful way. Buffers of ones and zeros can be transferred between two X.25-compatible devices over an X.25 network, but X.25 in no way tells the devices how to interpret those ones and zeros.

Telephone Analogy

To return to the telephone system analogy, imagine a telephone customer in France direct dialing someone in West Germany. A link can be established and data transferred. That is, the French person can dial the West German's telephone number, the West German can accept the call by answering the phone and talking can begin.

However, unless both people speak the same language, no meaningful communication occurs. Similarly, if one X.25 user makes RJE-type requests to a 3270-type device, nothing valid happens.

Two final caveats are in order here. First, don't automatically assume that X.25 networks will always provide the lowest cost transmission facilities.

Recall that X.25 costs are based on the volume of data transmitted and a flat connect fee to the network whether you use it or not. If data volumes are low, a dial-up line could be the cheapest way to go.

If data volumes are very high, a leased line may be the cheapest alternative. X.25 networks are only cost-effective for the middle range of data volumes.

Resulting Curve

This results in a curve similar to Figure 3 where data volumes from 0 to X^1 should be on a dial-up line, from X^1 to X^2 on X.25 networks and greater than X^2 on a leased line.

This evaluation should be done for each communication path. Only then can the customer be sure he has the least cost communications method. Most customer networks will have a mix of all three types.

Lastly, X.25 networks are not yet available everywhere or between every pair of locations where a user might have facilities. This would require a long-distance telephone charge from the user's site to the nearest available X.25 facility.

So in addition to data volumes, X.25 availability is another important consideration.

Russo is product manager of network products for Hewlett-Packard Co., located at 1501 Page Mill Road, Palo Alto, Calif. 94304.

Information Synergy Envisioned

Cost-Cutting Tack Obsoletes Today's Networks

By Stephen Kane
Special to CW

If you are planning a data communications network, stop, immediately! If you are installing a data communication network, pause. The modems and multiplexers you are planning for and acquiring today are philosophically and technically obsolete. There is an approach that will improve price/performance and provide many operational enhancements. This approach makes data communications networks obsolete.

With the decreasing cost of computer hardware, there is an increasing number of processors and applications. These applications are increasingly on-line for improved accessibility. To support these on-line systems, data communication networks are utilized. These networks can be the classical polled environment (master-slave), the newer packet-switching environment (master-master), or some hybrid configuration.

Obviously, the quantities of computer terminals are also increasing. IBM vice-president and chief scientist Dr. Lewis Branscomb has stated that "today in the U.S. work force, there is a computer terminal for every 48 employees. By 1986, it is estimated there will be a terminal for every 10 employees."

This 500% computer terminal growth, in addition to the distributed data processing (DDP) node additions, will fuel dramatic increases in data communications networks. The networks designed for today's application and volumes will be under a constantly increasing burden, resulting in network reconfigurations and higher line speeds.

Electronic Office

Another major factor in the growth of data communications is the office-of-the-future, or the electronic office. Components of the electronic office include word processing, facsimile and electronic mail. In the past, IBM was the acknowledged leader in word processing, a term originated by IBM.

The current leaders in word processing and in office automation were not well-known just a few short years ago. The goal of the electronic office is not to increase a secretary's typing speed (current industry estimates are $11 per page, delivered to the recipient), but to improve white-collar productivity.

The potential benefits are enormous. Citicorp has estimated it can save more than 30 to 40% of its management costs by eliminating paper funneling channels of management.

The electronic office provides a significant opportunity to reduce operational costs and to improve corporate responsiveness to changes in the marketplace. Although the growth and potential benefits are substantial, the electronic office of the future is in an evolutionary stage of development.

Both computer communications and the electronic office currently use modems on analog telephone lines. Within a single organization, multiple computer communications networks with multiple application data bases are common.

The reasons for this situation are usually terminal to computer incompatabilities and the lack of terminal accessibility to multiple applications. The same problems will exist when installing electronic office networks.

The installation of these networks will clearly produce many redundant communication paths. The duplicity will manifest itself in multiple network software, equipment, maintenance and management.

The elimination of this redundancy is a significant problem, but many "solutions" exist. France and Canada have a national data communication network based on X.25. IBM's solution is Systems Network Architecture (SNA), Xerox Corp. has Xten, and AT&T has the Advanced Communications Service (ACS).

Then there is the other side of the house, voice communications. Current voice budgets are significantly higher than data communication budgets. At the National Bank of Detroit, our data communication expenses for lines and modems is approximately $31,000/mo, while our voice expense is in excess of $200,000/mo.

For a long time, the Bell Companies have had few voice-related features to offer their customers. The non-Bell or interconnect companies, however, have been innovative, providing additional features with significant cost advantages.

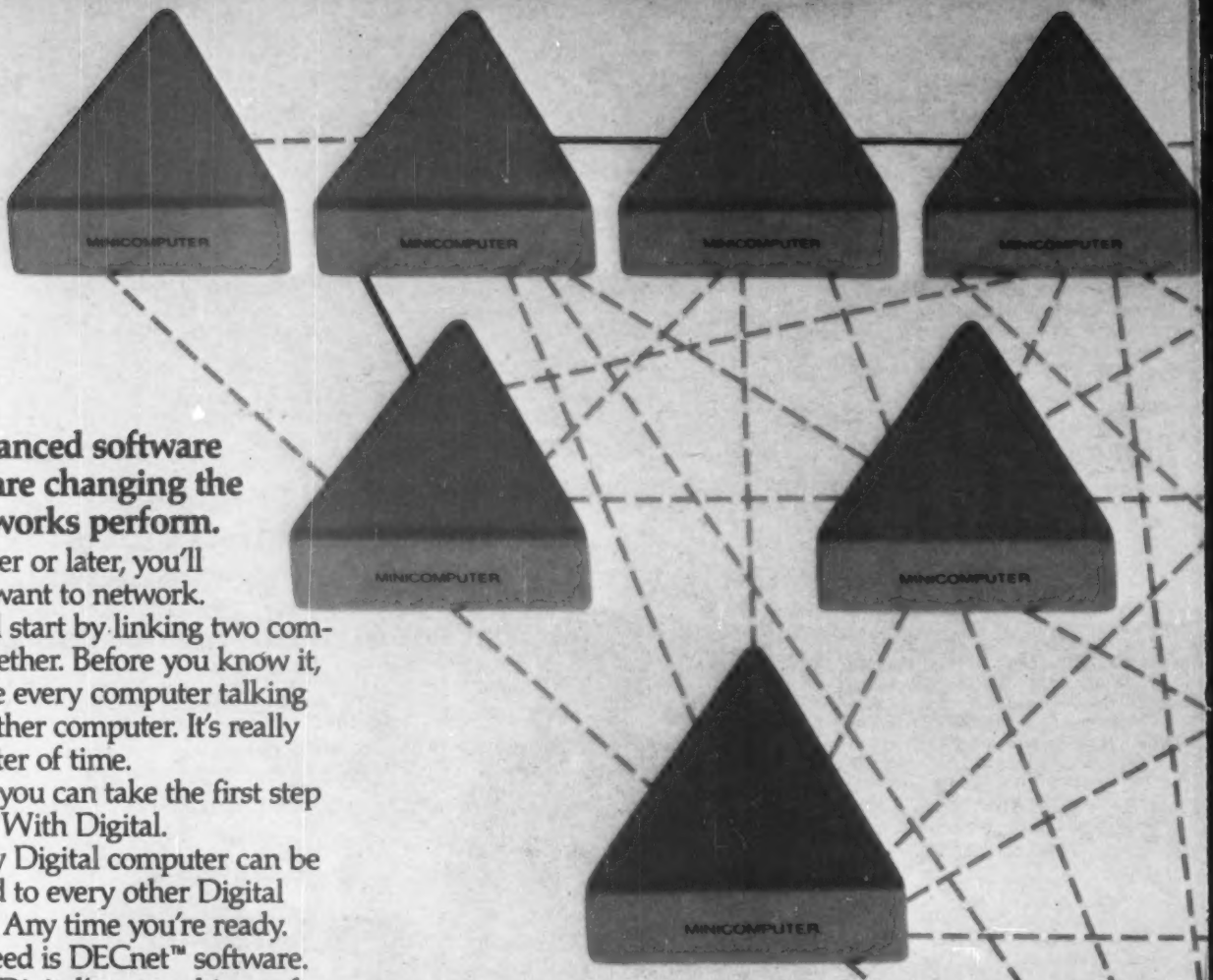
MCI Communications Corp. has been offering reduced-rate long-distance telephone service for a few years, using original concepts now adopted by other companies. Rolm Corp. has had great success in marketing intelligent private branch exchanges (PBX).

The availability and the cost performance of digital telephone is constantly improving. Reliability and system sophistication is increasing, with the relative cost decreasing.

This will make digital telephone systems a continuously more attractive investment and will also provide a hedge against ever increasing telephone costs.

(Continued on SR/20)

Nobody networks



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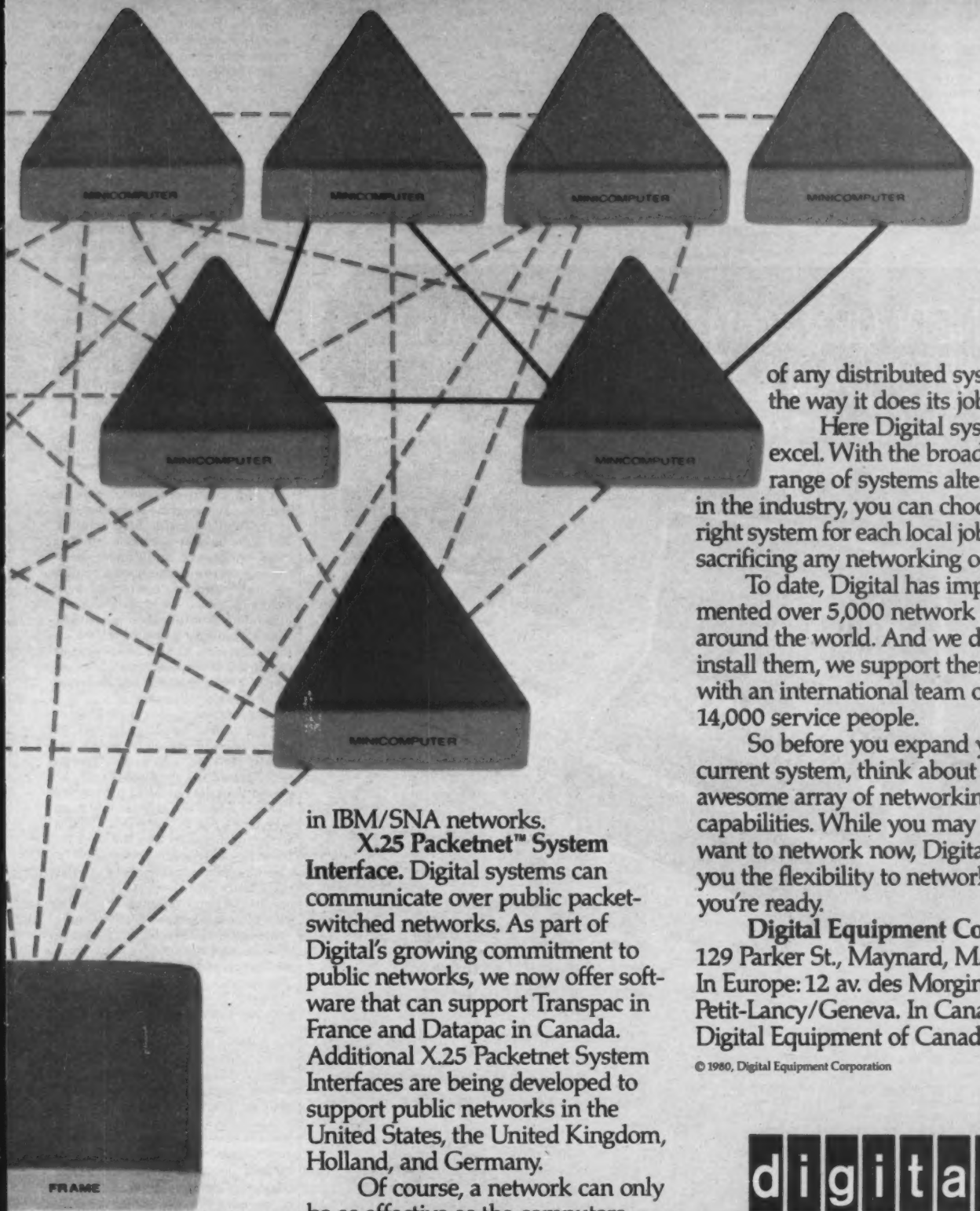

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We change the way the world thinks.

Information Synergy Envisioned for Networks

(Continued from SR/17)

It is clear that voice communications is moving rapidly to a digital environment at an ever increasing speed. The relative merits of digital over analog communications is reminiscent of the discussions years ago of digital computers vs. analog computers, the results of which are now clear.

Therefore, a "digital highway" that will accommodate all forms of digital data — voice, data, facsimile, word processing, etc. — is key. This digital highway must accommodate intra-, and interoffice information transfer on switched-, as well as leased-line facilities.

Current digital PBX vendors offer such facilities. Some of the features include:

- Switched and leased facilities provided via the concept of virtual circuits.
- Multiplexing included by the nature of virtual circuits.
- The ability to directly access telephone company's T1 carrier (1.544M bit/sec).
- The ability to interface to Bell's Digital Dataphone Service (DDS) facilities.
- The ability to provide analog voice interfaces to Bell circuits.
- Intrabuilding communications via fiber optics.
- Redundant processors.
- RS-232C interfaces on all telephone sets that provide simultaneous, nondegraded, voice and data transmissions over two twisted pairs.
- RS-449 interfaces.
- Data speeds to 56K bit/sec, synchronous or asynchronous.
- Remote diagnostics.

Some features that have been discussed, but are not yet announced, are:

- X.21 circuit-switched interface.
- IBM 3277/3278 coaxial cable interfaces.
- Speed, code and protocol translation — such as ACS.
- Satellite interfaces.
- Performance statistics.

These features are obviously not all inclusive. They sound like features offered by the modem vendors, such as Intertel, Codex, Paradyne and Racal-Milgo.

The most significant difference between the modem and the PBX vendors regarding these features is that the digital PBX's are 99% soft. That is, these features are implemented through software, although some — RS-449, for instance — may require hardware modifications.

The key benefit is that the systems are easily upgradable. They can easily accommodate the addition or deletion of any features, configuration modifications, or any other changes.

Moreover, the PBX installed today, will be functionally identical to the PBX that will be shipped in say five years, thus minimizing technical obsolescence.

If a digital PBX were installed today, it would provide immediate operational cost savings for voice communications of 10% to 20%. Computer terminals could be then added at a minimal cost, then DDP nodes, then alarm circuits, and then electronic office components.

All of these devices would be able to interact with each other, providing significant improvements in application accessibility and interoffice communications. There would be a single, digital, information transfer network to manage and maintain, thus simplifying operations. This "digital highway" would grow and expand. It would become a digital framework into which any communicating device could be added.

In addition to operational benefits and cost savings, there is another, but much subtler benefit. Each terminal will have greater access to all data bases — not only on different mainframe processors, but on minicomputers, distributed processors, and even word processors — and a sharing and integrating of information is possible. That is, multiple pieces of related information from various sources can be collected at a terminal, and this information can be analyzed and processed at the operators discretion.

A new perspective on a problem or on a business opportunity will be generated. A synergism is created, and new information is generated. The total information available will be greater than the sum of its parts.

This is where the greatest return on investment will be generated. This is where business will find the most interesting and rewarding results.

This new information is of greater significance than the cost savings and operational improvements. The synergism of new information will improve white-collar productivity, improve business sophistication, improve communication and identify new business opportunities.

In short, it will change the way business operates and provide tangible cost and operational savings at each step along the way.

We can lay the foundation for this synergy today, not by planning a data communications network with multiplexers, modems and lines, but by planning an information network. A network that will accommodate many device types, and one that will grow.

If this information network brings this synergism one year, or one month, or one week closer, we will have truly made a significant contribution.

Kane is an internal consultant for the National Bank of Detroit, located at 611 Woodward Ave., Detroit, Mich. 48232.

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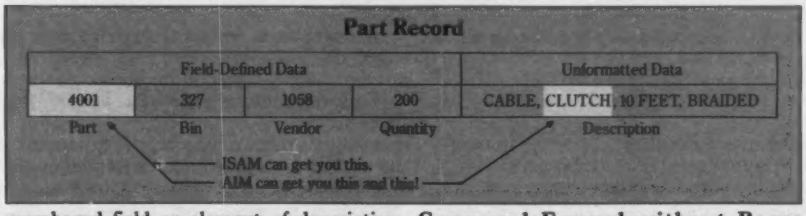

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Successful Nets Require Careful Planning . . .

By Garry G. Rasor
Special to CW

Successful data network implementation requires careful planning with plenty of input from the user's network department.

In today's highly technological and constantly changing communications environment, it is a challenge to design a network. Large books have been devoted to the subject. However, in the following passages we will briefly cover some of the major areas involved in most network configurations.

Many times user departments purchase a packaged deal without initially involving the technical staff. These people should be used to help spot possible incompatibility of hardware and software.

If at all possible, establish a level of organizational confidence in the network department so input is solicited at the beginning of a project. Otherwise it may be a process of making the pieces work and possibly finding missing parts. Unfortunately the user is not always to blame. Many times it is not aware of the technical staff's job function.

One cure for this problem is to get involved with the user. The technicians should be careful not to complicate matters by using DP jargon. Learning "business language" and practicing public relations with non-DP departments will have a positive effect on the network planning process.

Three Considerations

Other than natural variables such as maintenance and cost, there are at least three other important considerations that deserve notice. These are intelligence, security and future compatibility.

In a point-to-point link where batch transmissions are to occur with little or no error checking, a dumb teletypewriter-type terminal could be used for communications. On the other hand, if a multidrop scheme is used, then there has to be a certain level of intelligence at each drop.

The drop — terminal, concentrator and so on — needs the ability of knowing its address and answering an inquiry from the device doing the polling. Beyond the basic level, protocol — SDLC, HDLC and BDLC — and code — Asci II, BCD and Ebcdic — will need to be considered while choosing network hardware.

As an example, the IBM trend seems to be leaving the character-oriented protocol of BSC and going to the more sophisticated SDLC, which is bit-oriented. Regardless of which computer center is under consideration, if operation is to exist under the new bit protocols, then more sophisticated equipment will be needed. Thus the planning process should take this into account.

Security Measures

Another point of interest is data and operations security. Increasingly this subject is becoming more important in data communications.

Each industry has to decide on the level of protection it needs. Some, such as banking, are finding they need, or will need, the type of hardware required to provide a barrier to information theft.

One of the protective devices available is encryptive generators. These machines use a mathematical formula

'Each industry has to decide on the level of protection it needs. Some, such as banking, are finding they need, or will need, the type of hardware required to provide a barrier to information theft.'

to scramble information at the transmitting end.

Naturally this data is made coherent at the receiving end by a decryptor. Use of this technique in a polling environment could cause throughput problems because of the time required for data conversion.

However, with the lengthy turnaround propagation — approximately 160 msec — of the public switched network, it is possible to use these machines in certain cases.

Other Measures

Other security measures that can be considered are terminal locks — on/off key activated — that are controlled by one individual, no automatic answering on computer dial-in lines, fiber-optics cabling where possible — cannot be tapped — and so on. A good technical library would have references for other posssible measures.

The final variable under consideration is very important. That is the ability of the network to handle future information needs of the organization.

With technology growing in an exponential fashion, it is very possible that future information flow will depend on interfacing of word processors and facsimile devices with the central computer system. Thus there is the need to know these technologies and how they can be incorporated into the network.

Books have been devoted to the subject of teleprocessing software. Many industry experts claim this will be the primary communications medium in

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the future.

For sure, this is a high-priority subject, not only for futurist, but for present planners also. Indeed, with the complicated networks present today, employing control centers and high-level access methods such as IBM's VTAM, software deserves serious consideration.

Software Compatibility

One important area is compatibility of software. Lengthy conversions can result from trying to interface packaged and remote programming.

It is important to make sure the foreign packages will work with the present access method being used.

Considerable delay could result from converting the operating system to accept a different access method. Good planning could prevent this from happening.

The data set now has as many as 15 different options that have to be put in one state or the other, and it is the user who decides on the proper state.

We are no longer restricted to banging away at 300 bit/sec with a Model 33 on each end of the line.

Modems and Multiplexers

Once communications links are chosen for the network, data communications equipment (DCE) has to be considered. Under this category modems and multiplexing will be discussed.

A certain amount of research is required before any modem is selected. Other than line speed — which is determined by the modems and data terminal equipment — and type, demands of the EIA interface equipment — computer and controller — have to be understood.

'With technology growing in an exponential fashion, it is possible that future information flow will depend on interfacing of word processors and facsimile devices with the central computer system.'

This will require understanding internal modem operation. For example, there are phase and gain — amplification — settings on many modems. After the network is in operation, one or both of these settings may need readjustment — "fine tuning."

The important thing to remember is modems are simply one part of a whole — the network. For this reason good planning is needed to match all of the aforementioned units.

Pipe Analogy

Consider the following analogy. Assume there is a 2-in. water pipe — representing 9,600 bit/sec carrier bandwidth — that has a .5-in pipe (2,400 bit/sec line) connected to it. For this example there is a carrying capacity waste (cost) of 1.5-in. (7,200 bit/-sec).

Now with the addition of three more .5-in. pipes (2,400 bit/sec lines) or a 1-in. (4,800 bit/sec) and one .5-in. pipe we can input an equal amount to fill the main pipe.

To do this we need an interface unit with multiple small inputs and one large output.

For data communications, this would be a multiport modem or a multiplexer. Multiplexers are of two general types: frequency-division multiplexing (FDM) and time-division multiplexing (TDM).

The latest, most complicated multiplexing means is statistical multiplexing. This type of frequency synthesis produces the most cost savings in line utilization. However, it is the most difficult to incorporate into a multidrop network.

The above analogy is very simplistic, but may prove helpful to those who lack training in this area.

Measuring Devices

Last, and of equal importance in the planning process, is vendor selection. Respectable savings can result from shopping around and not locking yourself into one supplier. To do this, minimal measuring devices are employed. These are: service, price and equipment failure rate.

Usually the closer the vendor service center the better off you are. However one good tool to use here is the mean time to respond (MTTR) when a service call is placed.

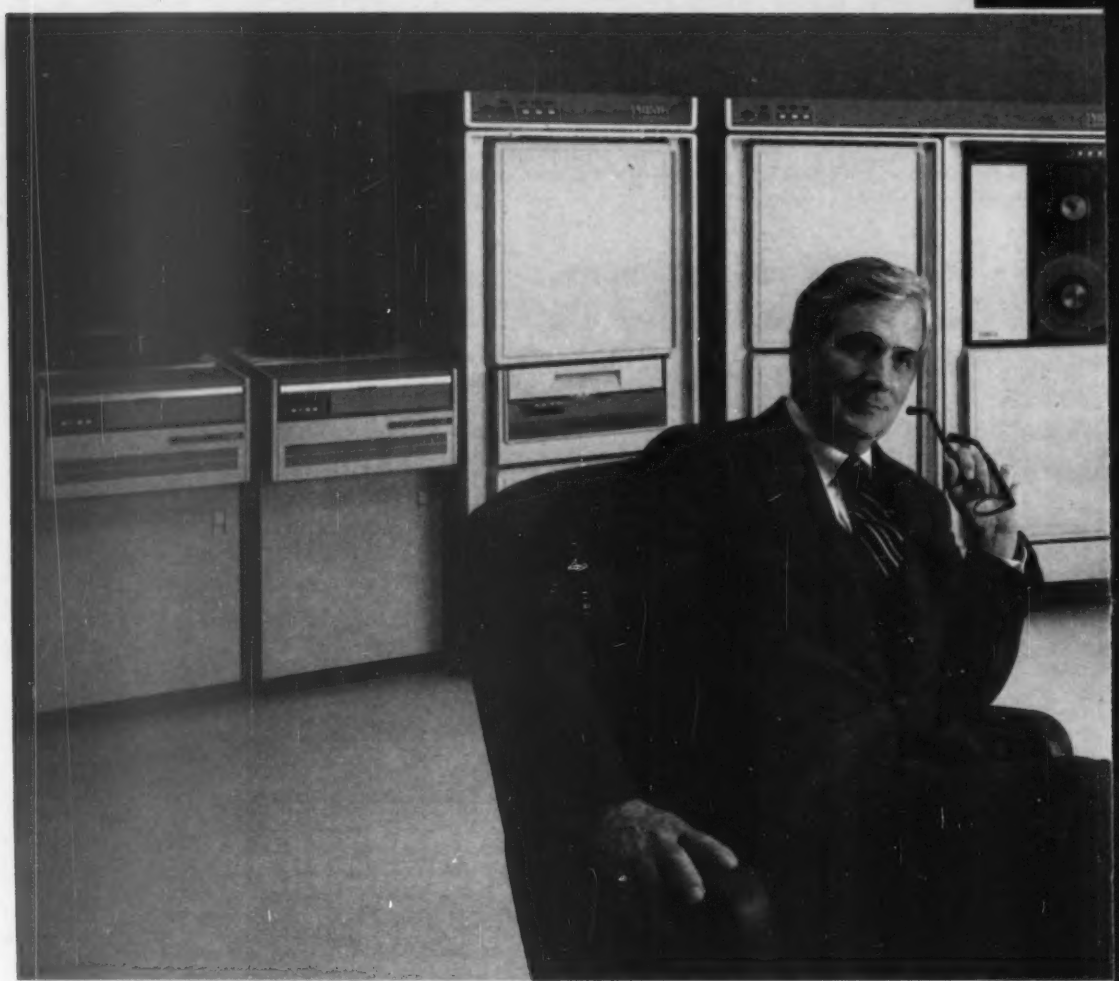
Naturally the shortest MTTR is the goal. But be cautious.

An aid in deciding on the proper MTTR and price is the mean time before failure (MTBF). The equipment with the longest operating life should be the most reliable.

When the above guides are satisfied, then requests for proposals (RFP) can be sent to a select group of vendors. Their financial response to the RFP is yet another tool to use in the decision process.

Lastly, a contract has to be drawn up and its contents agreed upon by vendor and user alike. This document should cover every aspect of network implementation; including the quality of installation.

Rasor is a telecommunications analyst with the First National Bank of Louisville in Louisville, Ky.



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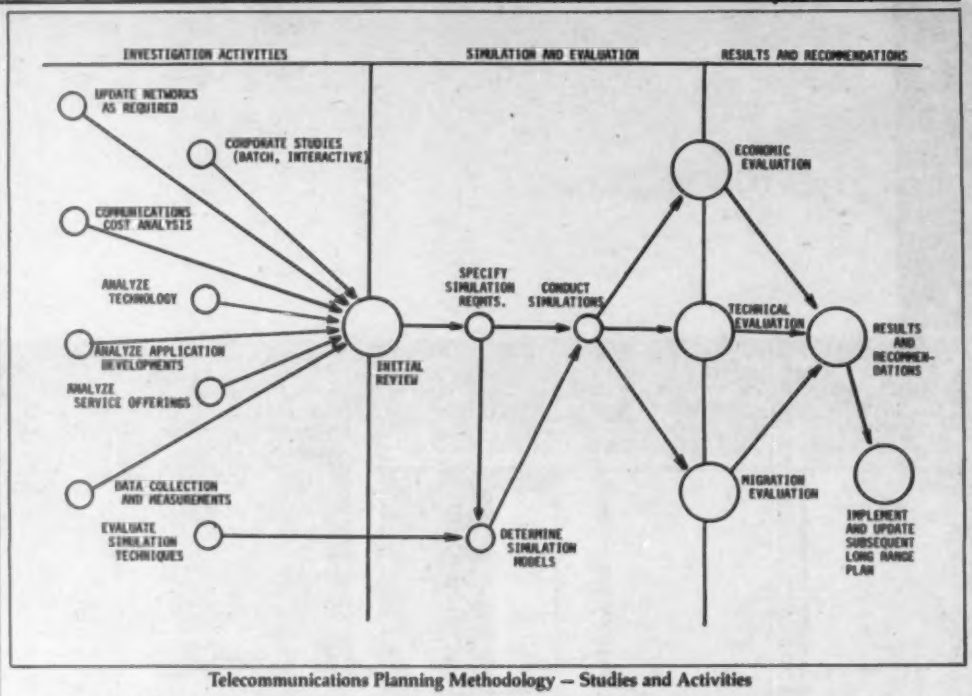

Telecommunications Planning Methodology — Studies and Activities

Initial Pragmatic Approach Required For Definitive Long-Range Planning

By Harold C. Walder
Special to CW

In order to devise a definitive long-range plan, it is required, in the initial phase, to fashion a pragmatic approach to the planning process. A series of logical sequential functions consisting of investigative activities, simulation and analytical evaluations, and results analysis and recommendations should be followed (see figure).

The investigation activities pursued are intended to study the current network environment and to examine future technology and requirements. Specifically, the investigative phase should include the following:

- Examine current networks to determine the short-range facilities updates required.
- Conduct corporate task force studies to evaluate batch, interactive and time-sharing requirements.
- Perform an analysis of current network costs and billing criteria.
- Assess future technology and service offerings.
- Analyze application developments and forecast user requirements.
- Perform data collection and analysis of traffic statistics and network system performance.
- Evaluate network simulation and modeling techniques.

The simulation and analytical activity is intended to combine the diverse activities from the investigative phase in order to produce meaningful results that would aid in the decision-making process for updated or new network implementations.

It is expected that this function will be an iterative process to allow the interaction of the many input variables.

The results and recommendations phase will examine the output of the simulation activity and evaluate economical, technical and migrational alternatives for implementing technological advances based upon corporate growth and user demand for improved services. The results will culminate in the updating of current networks and will be used to modify subsequent five year plans. And it is expected that the planning function will be an evolutionary process that will respond to changing business requirements and

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Spreading to Smaller Organizations

Systematic Net Planning Gaining Acceptance

By Harold C. Walder
Special to CW

Systematic planning of telecommunications is essentially practiced by many large corporations and the approach is rapidly gaining acceptance by smaller organizations as their operations become more complex.

The major factor influencing the introduction of a formalized planning activity is the anticipation of a changing environment that would offer many alternatives — both opportunities and potential threats.

Planning permits organizations to exercise favorable influence over future events. The overwhelming diversity of new telecommunication offerings, sophisticated techniques and services to be offered in the immediate future necessitates that an organized approach be pursued in order to consider these changes.

Strategic planning is interwoven into the entire management process and fundamentally applies to decisions that must be made at the top of the organizational structure. It provides to upper management a scenario that simulates the future on paper, but does not attempt to make future decisions, since firm decisions can be made only in the present.

However, strategic planning assists in bridging the gap between the present and the future. This type of planning is broadest in scope, has the largest degree of uncertainty, and the probable outcome is less known.

It provides a framework for formulating and implementing plans that are intuitive and anticipatory in nature and is based upon projected business needs.

In an optimal planning environment, there exists a flow of strategic guidance downward from top management in the form of qualitative goals, objectives and supporting policies. Within the same environment there must exist a flow of planning information upward in the form of draft tactical system plans and proposals for achieving the stated goals and objectives.

Tactical Planning

Tactical planning is directed toward implementing the strategic plans by coordinating the requirements of involved organizations. It is concerned with the utilization of the corporate resources in order to achieve its strategic goals.

This type of planning involves middle coordinating and operational management. While tactical planning is tentative and flexible, it does take advantage of the knowledge about a changing environment. A systems approach can be pursued to maneuver telecommunications facilities over time in a changing environment.

Tactical planning allows the quantitative examination of the chain of cause-and-effect consequences in time, permits alternative decisions to be made and is concerned with the development of short- and long-range plans that would directly affect operational management.

The implementation of these plans is intended to satisfy immediate telecommunication requirements through upgrading existing networks or acquiring new facilities. Long-range plans attempt to satisfy projected business needs and

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Pragmatic Approach Key to Long-Range Plans

(Continued from SR/26)

newly developing technology.

The planning methodology outlined should be applied to the creation of a tactical long-range plan. To accomplish this it is necessary to acquire an in-depth knowledge of currently installed networks.

Successful planning depends on an understanding of network performance, the level of service provided to the users, and the traffic volume that the networks can sustain.

Forecasts of users' demands must be made, technology assessments must be determined and special studies relating to the desired degree of voice and data integration must be undertaken. Also, simulation studies pertaining to cost, technology and migration must be completed.

The requirements in each of these major areas are expanded below.

To establish a base from which user demands can be projected and future technology applied, an intimate knowledge of the current telecommunications environment must be acquired. This is best achieved by developing a corporate data base containing a complete inventory of the current status of all telecommunications equipment installed or on order.

The data base should be a complete inventory of locations, connecting circuits, front-end processor terminations and host subchannel definitions. Network configurations should include terminals, multiplexors and port selectors.

Performance measurements of line utilizations, response times varying with different traffic loads and reliability characteristics should be noted. The inclusion of these parameters will build a foundation from which network growth can be forecast, costs projected and meaningful management reports generated.

The collection of network performance data will aid in providing an understanding of user requirements and characteristics of network traffic. The implementation of network control centers to monitor network performance and measure network reliability should be instituted. With recent advances in microprocessor technology the development of monitoring devices to measure user service levels — system availability, accessibility, capacity and utilization should be investigated.

User Forecast

User forecasts for development of new systems and growth of existing systems for telecommunications facilities are difficult to obtain for purposes of long-term projections. Even with long-range development planning in effect, it is difficult to translate development efforts into requirements for telecommunication facilities.

The request for a five-year users' forecast of their requirements for facilities will invariably result in linear-like growth for the first two years and a flat, no-growth trend projected for the remaining three years. This is understandable since long-term development planning is dependent upon business requirements yet to be conceived.

In order to obtain realistic projections of users' requirements forecasting techniques must be engaged for the purposes of obtaining meaningful growth curves. Valid results for a long-term forecast period can be secured by inputting historical data into a mathematical model. A Box-Jenkins time series analysis or a similar approach can be used to relate past observations of historical data and project future observations.

Technology Assessments

Long-range network planning is significantly affected by technological advances, new and developing communications concepts and corporate telecommunications postures. Therefore, studies and assessments of each of these areas become integral input into the definition of a methodology to meet future goals and objectives for telecommunications.

Long-range planning for the next five-year period will encounter broad and rapid changes complicated by the influence of technical, regulatory and marketing issues. An understanding of these issues is a key element to effective planning.

In a teleprocessing environment it is necessary that a technology evaluation be made of all components affecting the computer-communications-terminal link.

The future of central processors, storage and peripheral devices, communication processors, terminal equipment and the various telecommunication services must be projected and evaluated to determine the affect upon this environment.

A technical assessment of distributed processing, office-of-the-future offerings, electronic mail, teleconferencing, digital voice and the promise of integrated networks must be determined and the impact upon the future of a corporation should be determined.

It will require, in many instances, that in-depth corporate studies be undertaken to fully analyze the diversity of networks and the effects that technology might have upon an environment.

Task force studies in these areas are important for the purpose of providing direction for future offerings.

Walder is a senior member of Western Electric Co.'s Information System Staff, located at the Guilford Center, Greensboro, N.C. 27420.

Private Nets Risky

Leased Nets Best Chance to Fill Future Needs

By Bill Kernan
Special to CW

Private networks at this stage of technological development are likely to be risky propositions in terms of price/performance and capacity over the next five years.

Leased dedicated networks and the use of shared networks offer the best opportunity for meeting the future data communications needs of organizations. Computer service companies are often in the best position to offer network services since they have already acquired expertise in the field.

Planning a private data communications network that can meet an organization's future needs can be a futile proposition.

The problems are many, but generally involve data traffic growth projections and the capital investment necessary to accomodate future capacity. While short- and medium-range planning for data traffic is possible, the unpredictable element of technological change requires planning trade-offs that may be costly.

The interaction of these two planning elements should be kept in mind when evaluating the proposed network's future cost/performance. In time, the cost/performance issue may reach a critical point when traffic needs outstrip capacity.

At that point the data communication manager is faced with a decision to expand or improve a network that is based on technologically aging equipment or to scrap the system for a new one. Currently, the useful life of equipment is just under five years. Add start-up costs, personnel costs and maintenance, and an argument against private data networks begins to emerge.

Major Alternative

The major alternate choice is to lease needed data transmission facilities from companies that can provide instant networks. Computer service companies are often in a position to offer network services because they have already acquired experience and expertise in running networks. These technical strengths are supplemented by knowledge of user needs and strong support capabilities.

The most conspicuous advantage to leasing a network is fast delivery. There are minimum design problems, shortened implementation schedules, minimum capital investment and minimum personnel and equipment acquisition costs.

With the communication links up and running, and maintenance staff already in place, the bulk of the network planning effort has already been accomplished. Once performance criteria are determined, the design effort becomes transparent to the user.

Leased networks offer protection from technological obsolescence. With the changing concepts of network technology, the lack of universal protocol standards and competing technologies, there is a continuing widespread use of incompatible data communications equipment.

This in itself is spawning a new industry of conversion equipment to link the diverse systems. However, it is axiomatic that the greater the number of processing elements within a data channel, the greater the opportunity for Murphy's Law to prevail and create reliability problems.

A leased network can reduce compatibility problems with a range of capabilities that free the user from traditional suppliers of terminal equipment and enable terminals with different characteristics to look alike.

A key element in the rationale behind leasing a network is growth flexibility. The importance of this is demonstrated by studies that have measured a 400% increase in data communications traffic in the past five years.

By 1983, data traffic is projected to increase by at least another factor of two. Clearly if an organization's requirements parallel the industry growth curve, the cost implications of a 100% annual growth rate in the face of changing and nonstandard technology are terribly convincing that a leased network is the most cost-effective avenue to data communications.

Case in Point

A case in point is the experience of the DP organization of a large telephone operating company that came to National CSS, Inc. (NCSS), for assistance in setting up a data communications network to seven cities.

Prior to using the NCSS network, data transmission for the operating company was accomplished through the standard dial-up long-distance voice network. The problems with this method were obvious: it was the lowest grade of service; data integrity was difficult to maintain; and data communications had to compete with voice communications over the same lines, resulting in constantly busy circuits.

Initial internal feasibility studies on establishing a private network suggested a two-year development and implementation cycle. This brought the company to NCSS for an interim solution. After initial consultations with NCSS's data communications ex-

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Systematic Net Planning Gaining Acceptance

(Continued from SR/27)

they should be in concert with strategic goals and policies.

It is at this level that the alternatives of packet switching, public network services, private dedicated systems or migration to promised ones such as Xerox Telecommunications Network, Advanced Communications Service or Satellite Business Systems offerings should be evaluated. The requirements for distributed processing, office-of-the-future offerings, electronic mail and administrative message transfer media should be analyzed.

Most large organizations have experienced significant growth in telecommunication requirements over the past several years. Considerable effort to support separate network facilities to maintain voice, data, facsimile and administrative message transfer over a large geographical area has highlighted some major concerns:

- Increased growth demand has led to a proliferation of diversified and incompatible networks.
- Although unit communication costs are decreasing, total corporate communication costs are increasing at a rapid rate.
- Difficulty is evident in attempting centrally to manage geographically dispersed networks.
- A high level of network reliability is difficult to attain.
- The effects of new corporate processing philosophies and applications are unknown.
- Uncertainty exists as to the availability and capability of new vendor telecommunication service offerings.

The overwhelming diversity of new offerings and sophisticated services now offered or promised for the future, coupled with the general increase in user demand and experienced major problem areas, necessitates that an organized approach be developed.

Effective long-range planning has long been a strong desire of management and it has seldom been achieved in practice due to a lack of a workable methodology for technological assessment, cost estimating and user problem definition and integration.

In order to overcome these deficiencies, it is necessary to develop adequate techniques for planning that will keep pace with the growth, complexity and sophistication of modern telecommunications facilities and service.

In order to devise a long-range plan, such as that recommended on SR/27, it is necessary that an initial examination be made of user requirements, technological offerings and communications growth. The promise of tomorrow's high system reliability, widespread equipment compatibility, ease of host connectability, sophisticated network control and adaptability to varying traffic loads must be assessed.

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Leased Nets Best Offer

(Continued from SR/29)

perts, the company found that a permanent network maintained by NCSS would be more cost-effective.

Network architecture is structured around a dedicated Amdahl Corp. 470 mainframe with 160 parts. All hardware and software is developed and maintained at central data facilities of NCSS. Additionally, the facilities of the commercial NCSS network are available for overflow or short-term growth needs.

Even though the company had the wherewithal to implement a private network, by choosing to have a leased network planned, implemented and maintained by a computer services company, the operating company avoided high startup costs and all peripheral costs associated with a general private network.

They also avoided the liabilities associated with high data traffic growth and technological flux.

A senior network specialist with National CSS, Inc., Kernan helped install that company's data network, which reportedly now spans 100,000 miles.

Information as Resource

Net Goals Must Match Corporate Direction

By Dan Remy
Special to CW

The corporate information system function must ensure that the goals and directions set within management information systems are consistent with those of the company.

A key charter is to provide corporate managers with the information reference they need to make and support decision-making processes. Because of the accelerated nature of the business environment, the speed required to obtain information has become crucial to making timely decisions in a rapidly changing marketplace.

The recognition of the need for timely *and* meaningful information has led to the recognition that information is a resource, like cash and inventories, that must be managed to ensure accurate and speedy information flows.

'Because of the accelerated nature of the business environment, the speed required to obtain information has become crucial to making timely decisions in a rapidly changing marketplace.'

The management of information, carefully monitored and controlled as both a corporate current and long-term asset, has come to be known as information resource management (IRM) to reflect its true importance.

The managers and practitioners of IRM can no longer be data processing people, per se. Since information flows pervade each of the business functions — marketing, finance, production and engineering and service — the IRM professional must be totally aware of the business environment as a businessman.

The computer is then only a tool used to direct and control information flows to the business functions to provide a needed resource.

However, one must recognize the uniqueness of IRM in its duality as both a business and technical effort. The informationist must evaluate alternatives with respect to both technical capabilities and return-on-investment measured in dollars and not lose his perspective to the bottom line. Telecommunications, a technical field with many facets, represents one type of challenge to the managers of the information resource.

Complex Environment

Over the past 20 years, and most notably the last five, telecommunications has evolved and matured into a complex environment with many opportunities and pitfalls. A crossroad has been revealed where the opportunities for enhanced information management and cost savings are too large to incur as opportunity costs due to lack of planning.

The main impetus for increased data communications planning is that it allows for a systematic and the cost-effective development of a single multipurpose network.

The alternative to planning is the development and operation of many single-solution networks that overlap and are often redundant. Unnecessary redundancy is merely a lack of efficiency that downgrades the cost-effectiveness of the overall system.

The merging technology of DP, word processing and telecommunications has led to the concept of the "office-of-the-future." Further, the use of the same carrier service for voice, image and data has provided the opportunity for large cost savings from the multipurpose use of the carrier service.

In 1975, voice, data and message services were all distinct, separate disciplines that were administered by different individuals within the corporation. But within the last five years, we have had a merging of voice and data followed by the integration of electronic message and word processing functions.

'The office is the most undercapitalized portion of the labor market and represents a viable market segment for terminals and word processing equipment manufacturers within the next decade.'

The economies and efficiencies that result from this integration dictate that further progress in this area will be ag-

From a business planning point of view, the office is the most undercapitalized portion of the labor market and represents a viable market segment for terminals and word processing equipment manufacturers over the next decade.

A three-tier market has evolved: first-time users tend toward low-cost producers such as electronic typewriters and blind systems; more experienced users generally tend toward display-based systems with text editing and some arithmetical or other functions; and finally, the most sophisticated user tends towards multifunction display-based stand-alones

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'Fred Received the Analog Computer in Kit Form This Morning. They Took Him Away in a Net This Afternoon.'

Effective Net Goals Must Match Corporate Direction

(Continued from SR/33)

and shared systems including data communications capability.

Perhaps the best way to depict the office-of-the-future is by its components. Multifunctional video receivers with intelligence and processing capability would prevail. These videos would be capable of receiving corporate correspondence (electronic mail) with the recipient having the option of hard copy — thermal or printed.

Network Integration

The most significant change in the office will be the integration of voice, data, message and imaging systems into one network. Communicating word processors, desktop computers, Telex/TWX/facsimile and telephones will all share the same communications link.

Another way the office-of-the-future will differ from today is in the numbers *and* types of business systems used and the organizational changes that must be made to take full advantage of the new capabilities.

The now-separated functions of data communications, network design and voice/TWX/facsimile telecommunications will gradually merge into a functional communications entity comprising all the skills required to implement and manage the corporation-of-the-future's integrated needs.

These needs will span DP, word processing and communications in total and be responsive to the business needs of the corporation for all of its business functions — marketing, production and finance — as an integrated whole.

The cement of the office-of-the-future is basically communications. The catalysts are the large-scale integration and very large-scale integration revolution and large memory chips that have made intelligence available to most common office devices — (calculators, typewriters, phone switches and so on.)

Industry Metamorphosis

The next major trend will be the refinement and expansion into common usage of a number of existing technologies — a trend known as "industry metamorphosis."

This is already evident in the facsimile area. Xerographic printing technology and advances in digital communications are now spawning intelligent printers used for communications and office systems peripherals with CRT terminals and/or word processing stand-alone devices. Also, laser and ink jet printing is evolving rapidly to allow for plain-paper facsimiles.

It should be noted that, although soft data in the form of video displays will prevail, the hard-copy capability will continue to prevail either by custom or necessity in certain situations.

Social Solutions

In the next five years, we will see communications technology called upon not only to promote office efficiency, but also to help resolve larger social problems under the hat of corporate social responsibility. The use of teleconferencing and electronic mail are examples of how communications technology will be used as energy-efficient alternatives to business travel and traditional mail deliveries.

With the increased cost of commuting, progressive companies will be encouraged to have professional employees work out of their homes or in minioffices close to residential districts completely linked to the corporation via video, visual and conversational hookups.

Realistically, the sales and service office works in this manner today geographically, if not with the current technology available.

Remy is a member of Pertec Computer Corp.'s Corporate MIS Planning staff, located at 17112 Armstrong Ave., Irvine, Calif. 92714.

Especially in Business Use

Understanding Protocol Key to Mini-Based Net

By Roger L. Evans
Special to CW

The implementation of a data communications system with a minicomputer as the host is different in several respects from a data communications system with a large mainframe host computer.

Communication typically is over shorter distances — 50 or 100 miles rather than 1,000 or 2,000 miles — and minicomputer users usually have only one or two discrete data communication links to remote offices rather than a complex multinode data communications network.

The fundamental difference in implementation is that the minicomputer only supports, with very few exceptions, asynchronous "dumb" terminals, whereas the mainframe user typically expects his terminals to benefit from some kind of built-in communication protocol.

It is vital for all those planning to implement minicomputer-based data communications systems, especially in business applications, to understand the importance of communication protocol.

'If a terminal conforms to one of the defined communications protocols, such as IBM's Bisync, it operates error-free because it has the benefit of automatic retransmission-on-error.'

Communication Protocol

Communication protocol is a set of rules governing information flow in a communication system. The rules include a definition of the block format or message envelope which is used to "packetize" each message transmitted.

The message envelope, as shown in Figure 1, usually contains special control characters to mark its beginning and end, along with an address, so that messages can be directed to selected terminals.

It may also include a sequence number and/or block check character so that the receiving terminal may check the incoming message for errors. The protocol rules also define how a terminal acknowledges a message or, in the event it detects an error, how a terminal requests a retransmission.

If a terminal conforms to one of the defined communication protocols, such as IBM's Bisync, it operates error-free because it has the benefit of automatic retransmission-on-error; it can also be multidropped, either individually

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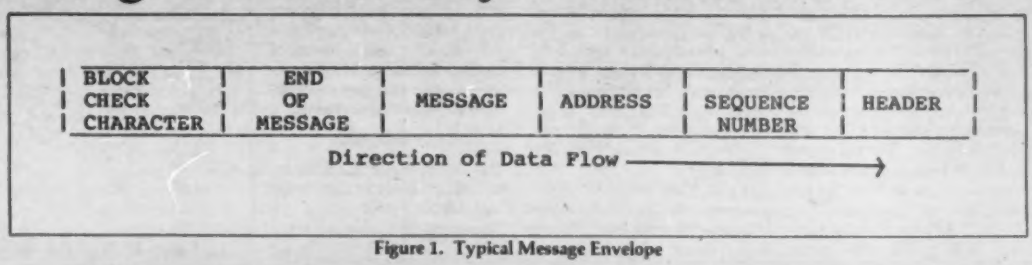

Figure 1. Typical Message Envelope

Understanding Net Protocol Vital

(Continued from SR/35)

or in clusters, with other terminals on a single line because it can be selectively addressed or polled by the host computer (see Figure 2).

Polling involves the addressing by the host computer of each terminal on the line, one after the other. The computer polls the first terminal which responds "NAK" if it has nothing to transmit or "ACK," followed by its message if it has a message to transmit.

The computer then polls the next terminal in sequence. If any terminal does not respond, the computer will "time out" and proceed to poll the next terminal.

Polling takes place constantly, in round-robin fashion. Outbound messages from the computer are also transmitted to each terminal when it is due to be polled. Typically, the ACK-NAK protocol is also used to verify correct receipt of messages or request retransmission.

Terminal polling is only possible if three criteria are satisfied:

- The terminal must be "smart" enough to have an address and be able to respond when it reads its address in a message received on the line.
- The terminal must be buffered, since it only has access to the line at the discretion of the computer. Such a system is only efficient if the message has been entered at the terminal and is ready for transmission in the terminal's buffer when the terminal is polled.
- The host computer must have software available to perform the polling procedure and support the particular communication protocol which the terminals are designed to use.

Typically, these criteria are only satisfied in terminals and data communication systems supplied by the large mainframe manufacturers or designed to be compatible with the product offerings of the mainframe manufacturers.

The minicomputer user is typically forced to use so-called "dumb terminals" and configure his terminals one per computer port as shown in Figure 3, thus losing the cost advantages of being able to put multiple terminals on one line and also losing the benefits of retransmission-on-error.

'The minicomputer user is typically forced to use so-called "dumb terminals" and configure his terminals one per computer port, thus losing the cost advantages of being able to put multiple terminals on one line and also losing the benefits of retransmission-on-error.'

An increasing number of data communications systems using minicomputers as the host cannot tolerate the risk of undetected data transmission errors and the telephone line costs associated with using multiple dumb terminals at a single office remote from the computer.

The solution to these problems is a range of currently available intelligent black boxes which provide add-on communication protocol — what Micom Systems, Inc. calls Add-On Data Link Control (ADLC) — to minicomputer-based dumb terminal configurations without requiring any changes to existing hardware and software.

'Error Controller'

The most basic element of the ADLC family is the "Error Controller."

The error controller is a low-

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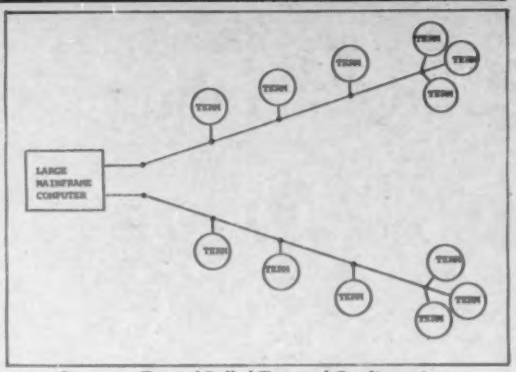

Figure 2. Typical Polled Terminal Configuration

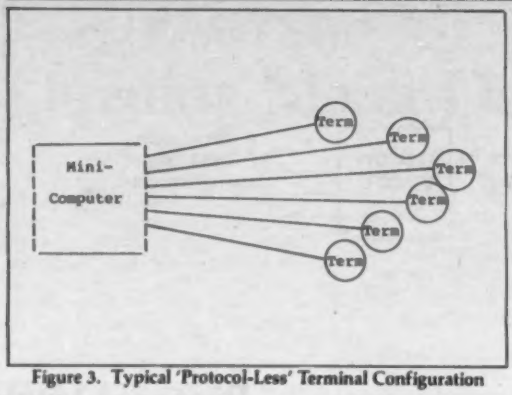

Figure 3. Typical 'Protocol-Less' Terminal Configuration

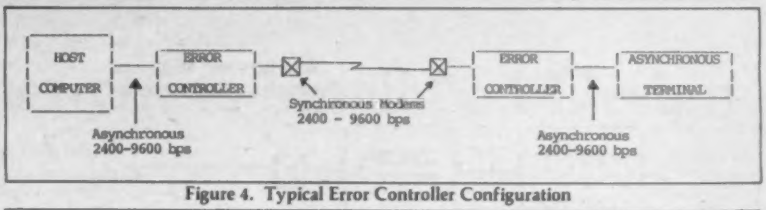

Figure 4. Typical Error Controller Configuration

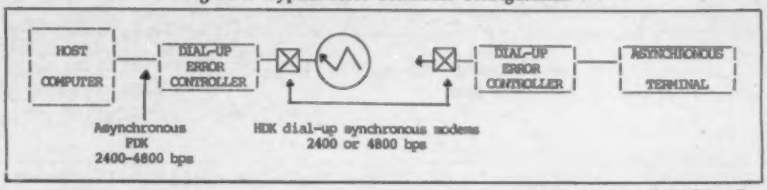

Figure 5. Typical Dial-Up Error Controller Configuration.

Net Protocol Vital Factor In Planning

(Continued from SR/36)

The error controller is a low-cost black box designed to provide automatic retransmission-on-error as well as the mode conversion necessary to allow an asynchronous terminal to operate with synchronous modems at 2,400 bit/sec and above. It is installed in pairs, one at each end of the leased telephone line, as shown in Figure 4.

In operation (see Figure 5), the error controller receives data character-by-character from the terminal or computer port and transmits it in a block format, with block length determined by the number of characters received since the last block was transmitted.

Each block starts with a "Header" containing control information. This consists of the sequence number of the block and also the sequence number of the last block received correctly in the other direction.

A Cyclic Redundancy Check (CRC) character terminates the block. The CRC is recalculated at the receiving end to ensure that the data block was received correctly.

The CRC is the 16-bit result of a polynomial calculation performed on the bits in the block and provides only a 1 in 10^{12} probability that a CRC will check out correctly with a block in error.

It thus reduces to almost zero the possibility that multiple bit errors will be self-canceling and thus avoid detection.

Another ADLC product, the "Data Concentrator," uses statistical multiplexing techniques to allow several "dumb terminals" to share a single telephone line, with one concentrator unit installed at each end of the line (see Figure 6). The device operates extremely efficiently with interactive CRT terminals, since it allocates the shared telephone line to each terminal dynamically, as needed, rather than on a predefined fixed basis.

The data concentrator acts as

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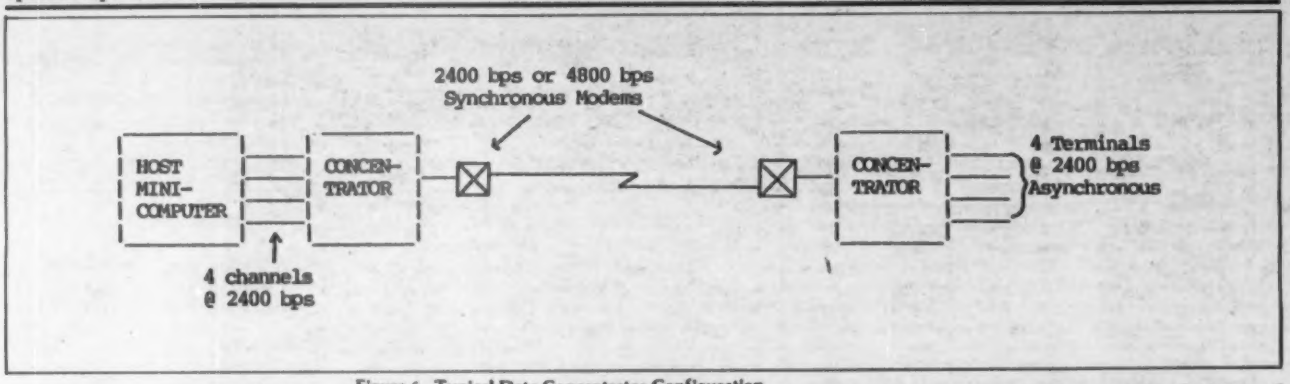

Figure 6. Typical Data Concentrator Configuration

Protocol Vital To Net Plans

(Continued from SR/37)

both an error controller and cluster controller for as few as two terminals, without requiring any changes to the existing dumb terminal hardware and minicomputer software. And it also allows the asynchronous terminals to be used with high-speed synchronous modems.

The third product in the ADLC family is the "Multidrop Concentrator," which uses the same statistical multiplexing techniques as the data concentrator, but, since the device can be configured in a multipoint configuration, it allows individual dumb terminals and dumb terminal clusters to be multidropped at different locations to share a single multipoint telephone line.

In operation, the master concentrator polls the remote node units at high-speed, accepting multiplexed inbound data from terminals at each site and delivering multiplexed outbound data addressed to individual terminals at each site. The multipoint data link operates synchronously at speeds to 9,600 bit/sec, but speeds of 2,400- or 4,800 bit/sec are most typical.

The availability of devices like the ADLC products has greatly extended the power of low-cost minicomputers and dumb terminals in implementing data communication systems for business applications where cost-effective reliable systems were not hitherto achievable.

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'All Right, Barclay — You May Use the New Computer Another 10 Minutes.'

Several Paths Open

Queuing Major Deterrent to Small Net Design

By Charles Pross
Special to CW

The major deterrent to small data communications network design by DP analysts is the complex queuing equations that are associated with network design.

Such equations are complex for someone who has not had formal training in queuing theory. However, a number of software programs are currently available on the market — either for outright sale or on a "pay-as-you-use" basis — that attempt to automate that part of the network design process involved with queuing theory.

There are software programs intended to fully automate the network design process. When applicable to a company's needs, these programs are generally very expensive and require detailed information about traffic characteristics anticipated for the network to be implemented. In presenting an alternative approach to network design, this article will not discuss such packages.

Present Status

Before dealing with that approach, let's review what network design encompasses nowadays.

Among the factors that have increased interest in private data communications networks for small to medium-size companies, the technologies of DP, word processing and telecommunications have begun to merge, resulting in the advent of a wide range of equipment enabling small businesses to integrate information resources efficiently and at a lower cost than previously possible.

In most companies, the senior systems analyst is the individual responsible for moving the organization in the direction of distributed processing. This person is usually well versed in the DP methodologies and often has access to the word processing manager, who is proficient in word processing methodologies.

However, in most small to medium-size companies, no individual in the company is well versed in data communications methodologies. Therefore, in most cases, a consulting organization is generally called in to aid in the design of the company's data communications facilities.

For large-scale data communications networks, these consultants can offer invaluable advice to a company. But when the number of switching or concentrator nodes is small, the services of a consultant may in fact not be necessary, and by using tools currently available in the marketplace, a network can be designed by the senior systems analyst that would be as optimal as one designed by a communications specialist.

For most small data networks, the protocol will have to be selected from among those supported by the computer vendor. In general, the choice of network protocol will be uniquely determined by the typed (interactive vs. batch) of traffic and the terminal vendor.

However, even in the case of multifunctional backbone protocols, small data communication networks can be constructed using the computational tools to be described. What is left at this point is the problem of designing a "glue" by which the diverse parts of the network can be tied together into a unified facility.

At the outset of any design effort three distinct sets of reference materials must be obtained. Information is generally best obtained by reading periodicals concerned with network design.

The second set of reference material deals with the methodology of network design. Such reference materials exist in the form of textbooks.

The third set of reference material deals with the current marketplace of products that are available to serve as the components of a data communications network.

One such product, Amnet, offered by Advanced Management Systems Corp., prompts the user for such information as:

- Average message block length.
- Average number of blocks per second.
- Line bit error rate and so on.

Menu Displayed

When all requested data have been entered, the system displays a menu in which the user may elect to change any given parameter or compute any of the list of unknowns such as minimum bandwidth required or average queue size.

Thus, the analysis proceeds one node at a time through all nodes. The partitioning of a network into separate nodes and solving for the parameters for each node fails for nodes within complex network configurations, but is accurate for small networks utilizing a straightforward backbone configuration.

It is therefore possible for small to medium-size companies that have private data communication network requirements to design and plan their own network.

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• *Escalating Management Awareness*

Data Communications Uptime, Reliability

By Charles R. Robbins
Special to CW

Data communications networks have come a long way since the first users began to attach modems to their business machines. Today, as DP applications are tailored to meet the specific needs of the user, the data communications networks in typical organizations have become important corporate assets.

As company networks grow in complexity, the continued uptime and reliability of these data communications links has taken on a new measure of importance. Much of this increased concern about network uptime can be traced to an escalating awareness by management about the vital role of communications. Corporate leaders recognize that effective networks are a key element in meeting company performance and revenue goals.

As part of the increased emphasis on corporate data networks, the functions of telecommunications management have also taken on new importance. It is no longer possible to consider communications as a self-contained function. A company's network has become closely related to other vital corporate operations, and this in turn has led to the development of new methods to monitor the communications system.

Only a few years ago, the first equipment aimed at network control was introduced. Although the idea of this equipment was to provide users with an important network control tool, the first systems offered only basic capabilities.

More recently, these systems have been enhanced to provide users with expanded features that often are tailored to the customer's application requirements. These more sophisticated control systems have given users capabilities that can be utilized to optimize data transmission operations.

But increasingly detailed network control functions have also made it more complex for customers to select and implement the systems and features best suited to their requirements. Thus the corporate telecommunications manager must be skilled in network control in order to effectively select such systems.

Guidelines Needed

When a telecommunications manager, in cooperation with other department managers, makes a decision to add network control functions some fundamental goals and guidelines must be established. While vendors of these systems stand ready to provide detailed support, the user must know the current and future data transmission needs of the company so these can be integrated into the overall plan to phase in a network control capability.

The user should approach potential suppliers of these systems with a clear understanding of the high-priority applications where downtime must be minimized. In addition, the geographic sites at which control functions will be implemented should be specifically defined.

The user should also have a basic concept of how network control will be added to the system. At the same time, corporate growth should be taken into account so that the enhanced data communications network will have built-in allowances for expanded operations.

The user who can establish such parameters prior to contacting network control vendors will be able to evaluate the best system for the company's needs in the most objective and effective manner. Vendor representatives can provide more effective technical and applications planning support if the user has a basic concept of how network control is implemented.

Complement Advances

Many telecommunications managers realize that the introduction of network control functions can often complement general advances in a data communications system. As many company networks are modified to incorporate distributed data processing concepts, the prospect of complete network control capabilities becomes economically attractive.

Distributed DP adds remote and geographically dispersed sites into a network. Typically, these sites are transmitting data for the first time and may be staffed by company personnel not well versed in the technical intricacies of network operations.

The dispersed locations and more complex network operations make it more difficult for telecommunications staff to keep networks operating properly. In these environments, the introduction of network control can add network reliability and monitoring capabilities that are often more cost effective than training on-site technical experts.

Network control systems can be implemented to allow centrally located telecommunications staffs to monitor operating parameters at all network sites. This makes it possible to add remote locations while still assuring network availability and reliability to meet corporate goals. Users that have a detailed understanding of such needs make it easier for vendors to suggest the proper mix of equipment to be in-

As Nets Grow in Complexity •

Gaining Recognition as Corporate Assets

stalled.

The first network control systems were implemented by large users such as banks and airlines who had widespread networks with high priority uptime requirements. But increased capabilities and ease of use have now made it feasible for small users to install this same type of equipment.

Moreover, the data collection features of these systems have undergone a gradual transition. Network control equipment had concentrated on monitoring important parameters to give users detailed technical data that made it possible to identify, diagnose and correct network malfunctions.

Needs of the '80s

In response to the needs of the '80s, vendors have begun to add operational data that is of interest to management. As top management has become more familiar with the relationship between communications and corporate success, this new operational data can give company officials a new perspective on day-to-day functions.

An example of this type of advanced system is the Intertel, Inc. EMS-One/-Sigma reporting and management system, which utilizes a minicomputer-based capability to build a customized data base of network statistics. The data collected as part of routine monitoring features can be summarized in the form of management reports that give key company officials important information on network operations. Telecommunications managers are finding that increased understanding of network function performance often plays a vital role when management is asked to approve network expansion proposals.

By adding reporting and management capabilities to network control systems, vendors are providing telecommunications customers with powerful tools. The ability to selectively monitor and summarize key network parameters and statistics gives managers the data to better understand the operational patterns of their network.

This in turn allows them to plan network expansion to support corporate goals and growth.

The concept of a closely monitored dynamic network is bringing increased opportunities for greater network efficiencies. As a result, new remote sites will be added to networks with a minimum of operational changes because they had been included in the long-term communications plan.

Modified to Meet Needs

Despite the most detailed plans, however, most users find that network needs must continually be modified to meet company needs. In such fast-changing environments, control systems that can be customized to monitor specific applications and network facilities assure the telecommunications manager that warning indications will be given before critical operating thresholds or line capacities are reached.

Furthermore, users appreciate the flexibilities of the current network control systems that monitor a wide variety of communications network equipment. By working with vendors to utilize the full flexibilities of these control systems, users can identify and correct network growth problems before they take on the dimensions of intolerable outages.

Future network needs will not be based only on expanding corporate growth. Many telecommunications managers are aware of the new technology trends that will broaden the communications requirements of the user. While today's networks are primarily based on analog private lines with some switched facilities, changes are coming. Public data networks, all-digital links and satellite facilities are among the emerging options expected to provide attractive economies of scale to communications users.

In selecting a network control system that meets today's needs, the telecommunications manager should carefully evaluate whether the vendors are making a commitment for state-of-the-art products. Vendors that have upgraded their network control systems to operate on more complex communications networks and have added features that allow automatic monitoring and management reports can be expected to keep pace with upcoming changes.

Users are becoming more aware that network control system vendors should have a history of incorporating new features with a minimum of effort and upheaval.

As reliance on network control increases, it becomes more difficult for telecommunications staffs to tolerate major disruptions in these systems — especially for the sake of upgrades. Most innovative vendors have a policy of incorporating upgraded features with a minimum of effort. The user should look for such assurances when selecting this type of system.

Network control is an evolutionary process for both user and vendor. As such, a continuing commitment from both parties to keep pace with a dynamic network environment can prove to be mutually beneficial.

Robbins is product marketing manager at Intertel, Inc., Andover, Mass. 01810.

Present Net Status Critical to Future Planning

By Murrell F. Jessen
Special to CW

As part of the network planning process, the present network's status should be carefully assessed. The following list of questions will aid this assessment.

1. Who is the data communication manager?
2. Should voice/data communication system responsibility be split?
3. Does he report to a corporate officer?
4. How many *independent* data networks in your company?
5. Are they application-dependent?
6. What is system availability for yesterday, last five days and last month?
7. Are reports mentioned in previous section available?
8. Are controls mentioned in previous section available?
9. Is batch processor work load greater than five day/-week, 12 hour/day?
10. What is your company's data communications system annual budget?
11. What is your monthly data communications cost? Total cost last year?
12. How many single function/purpose terminals in use?
13. How many multiple function/purpose terminals in use?
14. Is your network utilized in your company's revenue stream management? Expense stream management?
15. Is network operation erratic, difficult to pinpoint problems?
16. Are response times less than three seconds, 95% of the time for on-line traffic?
17. Management reports: Are they all timely? Do they contain latest up-to-date statistics? How are they delivered to user? Are they generated periodically or on demand?
18. How easy is reconfiguration?
19. How many hours per day, days per week for network operation?
20. What is the inventory of the current network configuration for the following, including location, type, traffic volumes by message type and hours:
    - I/O terminals.
    - Process terminals.
    - Data processors.
    - Modems.
    - Concentrators.
    - Multiplexers.
    - Front ends.
    - Common carriers: identification, services provided, traffic volumes and monthly costs.
21. Are applications handled by networks?

Data Movement

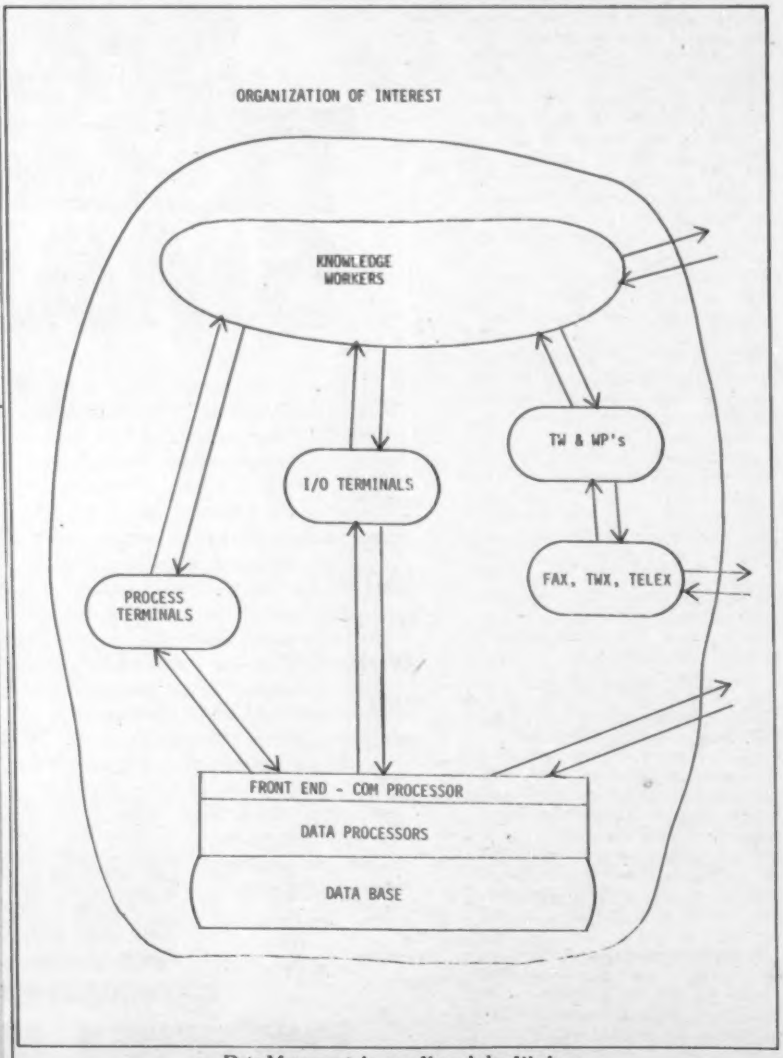
The accompanying figure represents the overall movement of data among knowledge workers, data processes, I/O terminals and data processors directly coupled to data base. The links among these include the network of concern and may in reality be several electronic networks as previously discussed as well as networks for information transfer as basic as walking, auto and air transport, company or common carrier mail system.

An interesting perspective is obtained by determining the number of knowledge workers, secretaries and administrative clerks, telephones, locations or buildings served, I/O terminals, process terminals (CAD, CAM, Scada and so on), data processors, typewriters, word processors and telex/TWX/fax terminals for the organization or company of interest in this planning project.

Typically, the number of phones is equal to the number of knowledge workers and is at least 10 times the number of I/O data terminals. The knowledge worker – also called the decision maker – is defined as the individual whose normal task and responsibility is to act as a result of information received and/-or generate information for someone else to act.

In general, this includes everyone in an organization except production workers, secretaries and administrative clerks.

Jessen is president of M.F. Jessen & Associates, Inc., a data communications consulting firm located at Suite 255, 5580 LBJ Freeway, Dallas, Texas 75240.



Data Movement Among Knowledge Workers

For Timely Flow of Data

Net Plans Must Run Under Corporate Aegis

By Murrell F. Jessen
Special to CW

A first and most important element of network planning methodology is placement of the network functional responsibility under the aegis of corporate-level management.

With this direction, a planning team is selected and organized. Members should include a responsible representative from each current and potential user organization. Professional project management techniques should be utilized for this planning activity, just as in any other well-managed endeavor.

Before proceeding further, it is imperative that the term "network" be defined. Webster's definition is: "A system of interlacing lines or channels."

The term *system* is significant. A network is a communications system and, specifically for the purposes of this report, a data communications system. A data communications system enables the movement of data between people, processors and processes, in all possible combinations (see figure below).

The planning of a network is an important step for a company to undertake. The major benefit of this plan is that it results in a managed resource.

This means that costs, performance and benefits are determined for the past and present, and anticipated. The values become readily apparent. Timely movement of data – information – throughout a corporation is directly proportional to the productivity of its decision makers.

Most networks have not had the benefit of planning! The great majority of networks today have availabilities of 90% to 95%, a commonly accepted level of performance.

Can you imagine being unable to use your telephone – no dial tone – 24 to 48 minutes out of each working day, not knowing when it will be unavailable, possibly at the most inopportune time? Considering only the previous parameter, this performance is consistent with networks void of planning.

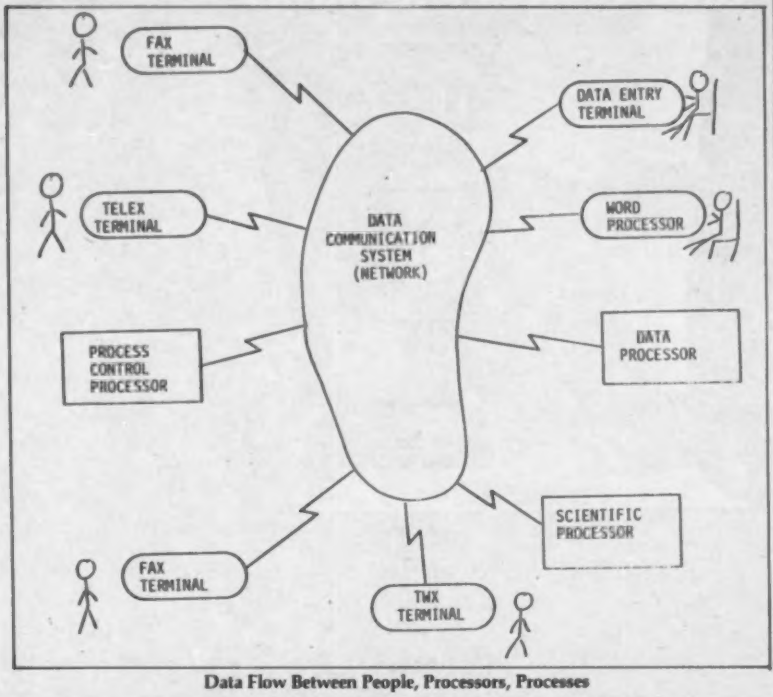
Need I say more about the desirability of a planned network? We can not totally blame users if they are hesitant about relying on the latest DP technology.

Network as Utility

An effective network is a utility, it is there when needed while providing desired data transfer at an acceptable error rate; it is application-independent and enables communication among all users functions.

A network contains all those elements – hardware and software – necessary for the movement of data. The elements include I/O terminals; process terminals such as data acquisition and process control; data processors; interconnect equipment and carrier

(Continued on SR/44)



Data Flow Between People, Processors, Processes

Placing Net Planning Under Corporate Aegis . . .

(Continued from SR/43)

(special and common) equipment and services.

These elements are connected in numerous configurations to purportedly best suit the needs of the user. Fortunately, today there are a considerable number of choices a user can make from the menu of suppliers in each element category.

Often, these choices are left by default to the mainframe data processor supplier, which in most instances is not a major technological contributor in this field.

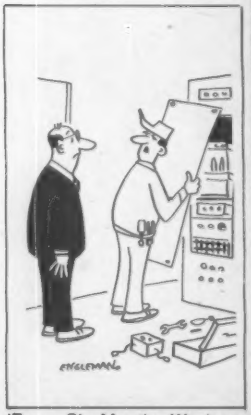
The I/O element is the source and destination of the data handled by the network. This element consists of specific hardware and software that is application-independent and communications-related. Functions such as line protocols — bisynchronous, Synchronous Data Link Control, a synchronous — and line termination hardware are included.

The interconnect equipment elements include modems, multiplexers, concentrators, front ends (communications processors), private branch exchanges (PBX), message switches and data switches. These give the user the ability to interconnect the terminals, processors and processes into the most advantageous configuration, as well as the capability to manage the network.

The third and final element, common-carrier equipment, includes microwave, coaxial cable, conventional cable, fiber optics, central switching and satellites.

Common-carrier services include line switching (dial service), private line (dedicated) packet switching such as Telenet and message switching such as TWX or Telex. The contents of the third element are tariffed and available in a variety of competitive offerings for the discerning user.

Performance of a network is measured in the following ways:



'Every Six Months We have to Add More Numbers to Keep Up With Inflation!'

- Percentage of availability.
- Load handling capability based on design response (transit) times defined by the number of messages or transactions handled per unit of time and throughput (peak or average) by line, node and total.
- Error rate by line, node, and total.
- Response (transit) times based on percentage of loading.
- Optional capabilities such as code conversion, protocol conversion, message transaction, storage (short- or long-term) and store-and-forward.

A managed system has at least the following alarm-reporting capabilities:

- Terminal, line, communications and data processors and interconnect equipment status on demand or whenever status changes.
- Traffic statistics per unit of time for terminals, lines, nodes, total and histograms.
- Retransmission and delivered and undelivered statistics.
- Percentage of utilization by line, node and total.

The following control capabilities are applicable:

- Open, close, skip and poll individual, group, all lines or stations.
- Alternate routing and destination.
- Add or delete terminals, lines and nodes.
- Hold or release traffic and all, individual or group lines or stations.

Network planning warrants a careful assessment of the present data communications resources' status (see SR/42).

Is there adequate data communication capability provided among all the nodes indicated; in turn, where are the bottlenecks? Which links

. . . Important Prerequisite to Timely Data Flow

should be electronic? At what data rate? Should there be a closer coupling between the knowledge worker and the data base? These are network-related questions of concern, to be addressed in the network plan.

When the data necessary for characterization has been gathered, the analysis and assessment of today's network can be initiated. One must be aware that a data communications system is a utility for use by the knowledge worker. Using this system will conserve time, which is a *nonrecoverable* resource and one of the most important contributors to improved productivity of each knowledge worker and the company.

Merits and deficiencies should be noted and an overall assessment made from the viewpoint of the user, i.e., system performance and maintainability, growth capability, cost and manageability. Are the most cost-effective network elements — terminals, interconnect equipment and carrier equipment and services — in place? Could the system be reconfigured for less cost and better performance?

A document describing the detailed findings, merits, deficiencies and overall assessment should be prepared and reviewed.

After identifying the current network's characteristics and assessing their relative importance, the user will typically find it easy to determine the prospective network's near- and long-term needs.

At this stage, the user should establish priorities based on need, complexity and estimated cost and time to implement; and these priorities should then be translated into near- and long-term goals.

A document describing network requirements in detail, near- and long-term and priorities and benefits should be prepared and reviewed, using the previously written report as a reference.

In the process of, first, establishing corporate-level responsibility and organizing the planning team; second, briefly describing networks, elements, management and performance parameters; third, characterizing the current networks, the merits and shortcomings; and fourth, near- and long-term requirements; the framework for a three- to five-year plan has been established.

A review of current technology is the next step. Relative costs, performance and availability of network elements under consideration must be determined. Detailed budgetary costs and schedules need to be established for near-term — one to two years — actions.

Longer term actions, costs and schedules should likewise be determined; however, it will be more difficult to acquire an equivalent level of accuracy. Adjustments in priorities and reconsideration of various options may be necessary at this stage.

This is the basis for a three- to five-year plan to be documented, reviewed and approved. The immediate (upcoming year) near-term actions, plans and estimated costs can be submitted for review, approval and funding as a project.

Annual reviews and updates are mandatory for the network plan. Updating is essential when considering the rapid changing technology and highly competitive markets.

After the plan is approved by top management, professional project management techniques will probably be utilized for implementation team formation, system design, documentation, implementation, verification and performance auditing for each project.

Planning and implementation are of equal importance in the overall process of attaining desired benefits. The point we are making is that all too often the most critical and significant portion of the project is defining the problem.

The key parameters for a planned network have been highlighted along with techniques for increasing awareness of network-related problems, thus the benefits of a planned data communication system are attained.

Jessen is president of M.F. Jessen & Associates, Inc., a data communications consulting firm located at Suite 255, 5580 LBJ Freeway, Dallas, Texas 75240.

Industry Watchers Tout

By David L. Hinders
And Patricia A. Becker
Special to CW

Although industry watchers have touted the benefits of distributed data processing (DDP) for a number of years, until now most businesses have been reluctant to put operations in an on-line dispersed data network.

The reason is fear — fear that the user cannot get to the data in a distant location and fear that once critical business information is on-line, it will not be consistent throughout the network.

Establishing a distributed network is an attempt to meet one or more of the following objectives: distribute processing power closer to the end user, reduce communications costs, increase performance and decrease response time by distributing the data and achieve higher system availability.

The manner in which the network is configured, however, can have significant consequences in terms of communications costs, software development time and costs and network expansion capabilities.

There are nine key issues in network configuration that need to be addressed by users and vendors of data communications networks:

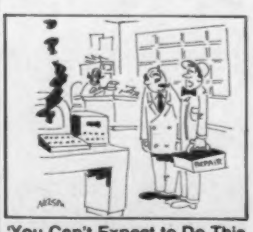
- Availability of on-line data.
- System compatibility.
- Ease of access to geographically distributed system resources.
- Flexibility of communications connections.
- Network expansion.
- Ease of programming applications.
- On-line adaptability.
- Network control facilities.
- Consistency and integrity of information stored in geographically distributed locations.

The true benefits of distributed processing come in bringing the processing power and the most frequently accessed data closer to the end users. Therefore, the two primary areas of concern to all network users are: (1) Will the computers in each node of the network be up and running when the data is needed for processing? And (2) will the communication links connecting each node be available when communications is required?

When data is stored at geographically independent locations, the system node storing the information necessary for business operations must be continuously available to network users. Reliability of the hardware and software in each system of the multiple-node network thus becomes crucial.

In addition to the high availability of system resources, the integrity of the communications network must be maintained. Network operating systems should be designed to reroute messages dynamically in the event of a line failure.

Better still, the network should have the capability of accommodating multiple lines to provide a redundant path. Of course, the added benefit would be the ability to utilize multiple lines for faster



'You Can't Expect to Do This Much Business With a Small Business Computer.'

Benefits, But Businesses Slow to Adopt DDP

throughput and increased data volume when all lines are available.

Software Factors

Selecting the equipment for each node of a network requires consideration of factors other than just the hardware costs. If only hardware costs are considered, it may make sense to install different kinds of computers at different sites.

In a network, however, software costs increase as the number of vendors increase. Different programming groups are required for the different processors. Incompatibilities in data types, operating systems and programming languages must be resolved. Making a relatively simple change at the network level may involve extensive reprogramming requiring extensive coordination.

Implementing a data communications network presents users with a complex task of addressing and accessing dispersed data files. Network software should be designed with the user in mind. This really means that users should be able to access the resources of any node — processor, files or physical devices — without regard for the physical location of the resources. A query to the networkwide data base should be able to access files in dispersed geographical nodes, all totally transparent to the user.

Ideal Setup

Ideally, the user of a distributed data network should have the broadest range of options for communications interface. Depending on the distance and data traffic, users should look for network operating sytems that offer multiple connection capabilities.

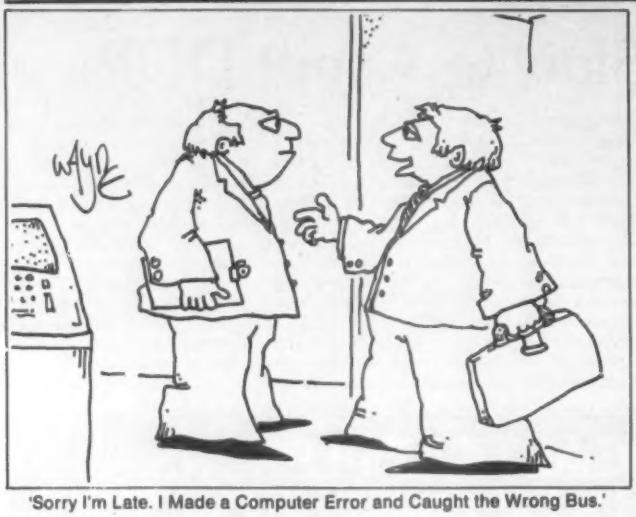
Therefore, networks providing the capability of connection to dedicated private leased lines *and* public data networks — such as those based on the X.25 standard — would give users the greatest flexiblity in meeting their specific communications requirements.

Of primary concern to most network users is the ability to expand the network once it is up and running. System expansion must be carefully planned because mistakes can be very expensive.

The user should plan for both the expansion of the network and the hardware expansion of individual systems. In regard to the latter, it should be noted the even with a single vendor, different sizes of computers often use different, incompatible operating systems and access methods.

Thus, outgrowing a particular processor may involve extensive reprogramming. Reprogramming without gaining additional system capabilities is the most expensive kind of programming. Users should look for vendors offering the necessary system and network expansion facilities consistent with future needs.

(Continued on SR/48)



'Sorry I'm Late. I Made a Computer Error and Caught the Wrong Bus.'

Despite Experts' Efforts, Business Slow to Go DDP

(Continued from SR/47)

The costs associated with the development of network software can be awesome. Complicating this is the fact that software development personnel capable of implementing an on-line data communications network are scarce.

Vendor-supplied support programs, therefore, are an important consideration in implementing a network.

'Probably the most important element of any distributed network is the integrity of the data. Users should look for vendors offering such capabilities as an end-to-end protocol that assures message integrity from sender to receiver, regardless of the number of intervening nodes involved in the transfer.'

Users should look for network software that supplies a variety of developmental and diagnostic tools to ease the programming burden. Vendors offering complete network software are perhaps a better choice for users without substantial in-house data communications programming resources.

On-Line Adaptability

From a user's perspective, the method by which messages are routed throughout the network is of prime concern. Two elements are of particular interest here.

First, an automatic routing capability — and rerouting in the event of line failure — assures that messages will be received as sent. When a communications path is broken, the network operating system should be designed to retry until the transmission succeeds or until the system determines that the communications path has been completely broken. When a communications path has been broken, the network systems should be able to reroute the message via a different communications path.

The second consideration is a "best-path routing" capability that automatically selects the best path — the path with the least travel time between nodes. This assures users that the fastest communication path is selected.

Control Facility

Users of data communications networks need a control facility that allows the status of the network to be continuously monitored. These utilities might include logging of changes in network status (such as communication line up or down), logging of changes in remote systems status (such as devices and processors up or down), display of any network changes and the display of network traffic.

Probably the most important element of any distributed network is the integrity of the data. Users should look for vendors offering such capabilities as an end-to-end protocol that assures message integrity from sender to receiver, regardless of the number of intervening nodes involved in the transfer.

In addition, vendor-supplied software capable of backing out incomplete or aborted transactions across a networkwide data base is of critical importance in assuring the consistency of data distributed geographically.

Hinders is manager of systems software at Tandem Computers, Inc. He was responsible for the architecture and design of Tandem's communications networking software.

Becker is marketing communications specialist for Tandem.

System Minimizes Interruptions

Railroad Gets a Handle on Network Control

Special to CW

ST. PAUL, Minn. — When you're busy managing, scheduling and maintaining the freight operations of one of the largest railroads in the U.S., the last thing you want to worry about is the transportation of data.

For that reason, Burlington Northern, Inc. has always insisted on better than average reliability from its data communications network.

Early in 1970, when the company was formed by the merger of four independent railways, complete responsibility for planning and overseeing its vast network was turned over to a single group of data communications professionals. From then on, a Communications Center located at BN headquarters here has been the hub of network activity — routing and physically monitoring all line traffic 24 hours a day, seven days a week.

According to Don Goodwin, manager of data communications, system availability is critical — and not only in terms of the heavy flow of on-line data traffic involved. At Burlington Northern, it also directly affects the safety and efficiency of actual train movements.

With more than 800 daily freight and passenger trains that must be tracked, cargo that must be scheduled and billed and close to 25,000 miles of railroad that must be maintained, any serious problems with communications cannot be tolerated.

More Than 1,000 Users

To offer maximum service for more than 1,000 terminal users, Burlington Northern owns and manages four separate Rockwell Collins microwave systems that span some 4,582 miles of territory. These are augmented by a network of dial and leased lines, with much of the assoicated equipment also company-owned and company-maintained to give Burlington Northern greater physical — as well as economical — control over its operations.

While a separate Management Services Group is charged with handling all data processing aspects of the 300 to 400 locations served by the Burlington Northern system, the Communications Group has total responsibility for the data transmission facilities.

"In the DP area, day-to-day concerns are more likely to center around software updates, new applications, system crashes and problems of this nature," Goodwin explained. "We, on the other hand, have to be constantly aware of what's happening in a highly vulnerable communications environment that's increasingly complex to control — where telephone line distortion and modem malfunctions are just a few of the factors that can interrupt transmission."

Keeping those interruptions to a minimum and helping to isolate and resolve any problems that arise are a few of Goodwin's most challenging tasks. Ever since modem diagnostics appeared on the scene, Goodwin said these tasks have become more and more manageable.

"With two groups — Management Services and Communications — in charge of a single information system, the lack of built-in diagnostic functions could very easily make 'finger-pointing' a daily occurrence. If there's a problem, how do you know whose problem it is? The questioning could go on interminably," he pointed out.

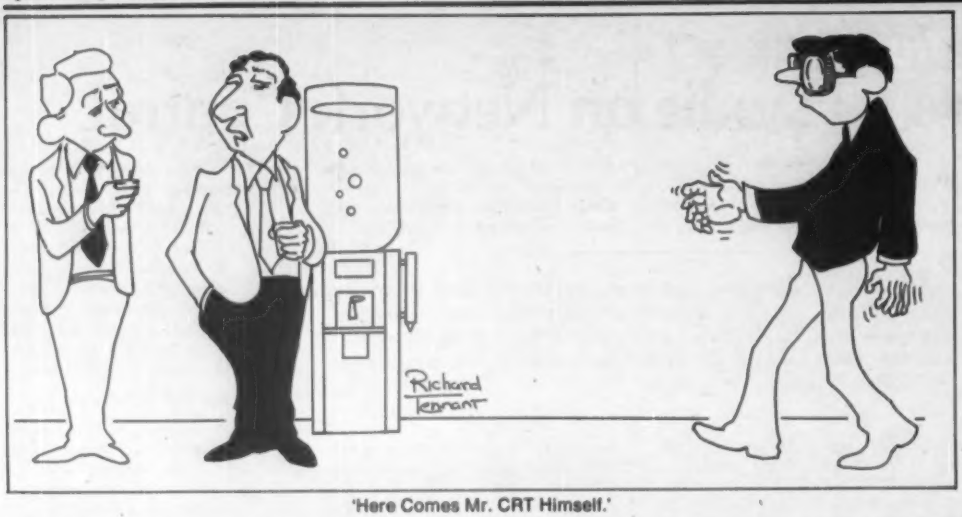
'At Burlington Northern, system availability is critical. With more than 800 daily freight and passenger trains that must be tracked, cargo that must be scheduled and billed and close to 25,000 miles of railroad that must be maintained, any serious problems with communications cannot be tolerated.'

Only Part of Solution

Today, modems with built-in diagnostic capabilities appear to be only part of the solution. Wanting some way to monitor and control its

(Continued on SR/50)

'He Followed Me Home. Can I Keep Him?'



'Here Comes Mr. CRT Himself.'

System

(Continued from SR/49)

network activity from the Communications Center, Burlington Northern now links about 60% of the network to a Codex Corp. Distributed Network Control System (DNCS).

With this system, the diagnostic capabilities of modems work in conjunction with a DNCS intelligent terminal system and network processor at the central site to monitor, locate and reconfigure system elements.

As Goodwin described it, this arrangement provides the group with the ability to perform continuous on-line network monitoring and to run tests and initiate restoral without involving personnel at remote sites. Instead, all activities are controlled from the DNCS terminal located in the Communications Center.

"Now," Goodwin stated, "we can perform most of the functions it used to take a warm body to do at the remote locations — pushing buttons, examining lights and indicators, going to dial backup if a leased line fails, putting a modem into fallback to transmit over a degrading circuit at lower speed or taking a faulty modem off-line and switching in a 'hot spare' unit.

"What we've gained by this — most definitely — is automation," Goodwin said. "We now have constant surveillance of the data circuits, and any problems are flagged immediately. In fact, we're able to get a handle on problems even before users are aware of them. That gives us a real edge."

Early Notification

The group is also notified of network problems at least 10 to 15 minutes before people in the main computer room see them, according to Goodwin. "We've simply mapped out the network — identifying lines, drops and so forth — and assigned threshold values using the preprogrammed menus and prompts on the CRT."

Whenever any one of these is exceeded, an audible alarm is sounded and an alarm report is automatically logged on DNCS' system disks and printer.

Immediately, the Communications Group can select from a menu of tests to pinpoint the location of a failure. A dynamic poll test checks the operation of a multipoint circuit in its true operating mode; bit error rate tests check modem functionality and end-to-end line status, as well as inbound and outbound line segments; and modem tests initiate loopback self-testing and isolate modem failures.

All results are displayed on the terminal screen in an easy-to-follow format. "To us," Goodwin said, "the ability to actually isolate problems this quickly — without remote operator intervention — is probably more important than anything else DNCS provides.

If users in the field are experiencing difficulties, they do not hesitate to call. "The hardest part is finding the problem quickly so you can fix it before service is interrupted, Goodwin said.

"Also simplified for us is the overall task of network management," he noted. "We can obtain a listing of all stations connected to DNCS, along with their status at any particular time. We can look at alarm reports to determine if any circuits are experiencing more failures than they should. And test results can be recorded for failure

Keeps Data on Track

analysis."

The decision to incorporate a system like DNCS was made last year, primarily because of the network's growing size and the variety of lines, speeds and locations involved. Burlington Northern was already operating with Codex Fast-Poll modems at 4,800 bit/sec and had plans to cut over at least 12 additional multipoint lines to 2,400 bit/sec.

Because the DNCS works with the secondary channels of both the Codex Fast-Poll series and Codex MX 2400 microporcessor-based modems, Burlington Northern found that network control capabilities could be added with minimal effort and expense, Goodwin said.

The Codex system also offered special advantages, according to the Communications Group. Especially vulnerable were two segments of the network that many other central site control systems wre unable to handle. The challenge, Goodwin recalled, entailed extending control to the multitiered sections — where lines are not directly connected to the central communications facility.

These appear in areas where the railroad operates its distributed "yard networks" — currently in Northeast Minneapolis, with plans under way to install similar systems in Chicago, Kansas City, Seattle, Portland, Denver and Spokane.

In each of these "yard" locations, two point-to-point 4,800 bit/sec lines are routed from St. Paul to a Digital Equipment Corp. PDP-11/70 processor, which in turn supports additional point-to-point lines connecting IBM 3270-type terminals. Although the PDP-11/70s only periodically communicate with the hosts in St. Paul (two IBM 370/168s and two Amdhal Corp. 470V/6s), the Communications Group still needed some way to monitor the second-tier lines from the central site.

This was accomplished very simply by bypassing the processor altogether — extending a crossover cable out of the secondary port of each modem directly connected to DNCS to the secondary ports of modems supporting the yard terminals. In this way, Burlington Northern was able to extend DNCS capabilities to all the remote devices, not merely those directly attached to the monitoring system.

Apparently, DNCS proves useful in another critical area as well: Burlington Northern's Denver-St. Paul connection. Here, Codex 6040 Intelligent Network Processors (INP) are currently used to statistically multiplex two 4,800 bit/sec lines, four 2,400 bit/sec lines, one 1,200 bit/sec line and one 75 bit/sec line, all originating in Denver.

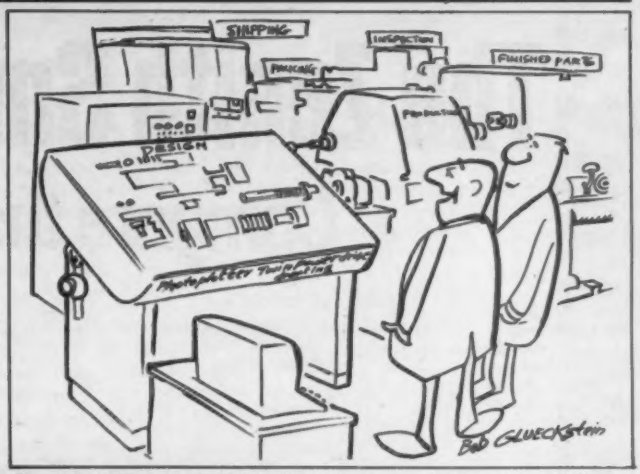
By dynamically allocating bandwidth and compressing data, the INPs enable these lines to be channeled to St. Paul via a single 9,600 bit/sec leased circuit, thereby reducing leased line charges substantially. To ensure reliability, two spare INPs were installed — one in Denver and one in St. Paul — to provide backup capabilities in the event of failure.

Network control capabilities were also added. Now, at the same time traffic and throughput statistics are reported by the INPs, the DNCS in St. Paul continuously monitors all associated lines and modems — simply by passing secondary channel data through ports of the INP.

Even with the master modems situated in Denver, Burlington Northern is capable of centrally monitoring and controlling all the remote modems and additional leased tail-circuits that extend outward from Denver.

And more connections are soon to be added. Goodwin expects to use the existing INPs to consolidate at least two additional 4,800- and two 75 bit/sec channels in the near future — and still have room to pick up more circuits.

With the merger of Burlington Northern and the St. Louis-San Francisco Railway, another 6040 INP will be added in Springfield, Mo., to consolidate additional lines running into St. Paul.



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CW1124

Backup for Single PDP-11

Chase Manhattan Adds VAX to Data Base

Special to CW

NEW YORK — The Chase Manhattan Bank here recently added a Digital Equipment Corp. VAX-11/780 computer to what was already the largest data base working from a single PDP-11/70 minicomputer.

The VAX machine is currently used for backup and data base development for the bank's summary performance report information delivery system (Sprids), a multiterminal setup that provides on-line analysis. The Sprids system monitors and analyzes the management accounting for the entire corporation, which includes more than 8,500 organizations and about 7,300 accounts, Daniel Maher, Sprids project manager, said.

By the end of this year, Sprids will have more than 100 users nationally as well as terminals in 35 different countries. The Chase Manhattan Bank is the country's third largest banking institution.

Analysis System

The bank's analysis system uses a total of eight 300M-byte disk drives manufactured by Systems Industries of California. Six drives are connected, in common, between the PDP-11/70 and the VAX, while two are dedicated to the VAX alone, Maher explained. This reportedly allows the 32-bit computer to be used for data base development and as an immediate backup should the 11/70 fail.

In addition, three RP06 200M-byte disk drives are used as a shared backup for both CPUs, Maher stated.

'We provide real-time access to all departments for any account in the corporation and also provide real-time variance analysis for 24-month periods, so that management can look at a comparative analysis in a department for an account in 1979 against the same month in 1980.'

"We provide real-time access to all departments for any account in the corporation," he continued, "and also provide real-time variance analysis for 24-month periods, so that management can look at a comparative analysis in a department for an account in 1979 against the same month in 1980."

The Sprids system can also provide the account's trend analysis for any department in the bank, which is listed month by month, actual and budget, current year and prior year. Finally, the computer can project what the account status would be at the end of the year.

Common Data Base

Chase Manhattan's Sprids reportedly incorporates the only operating system that combines an 11/70 and an 11/780 against a common data base. Although half of the system's users work off the 11/70 while the other half use the 11/780, both can access the same data off the disk.

The bank eventually plans to add a second VAX-11/780 to the system, replacing the 11/70, and add more peripherals including six to eight more System Industries disks.

The Sprids system is actually a compilation of four different data bases, Maher pointed out.

One gives the bank's executives a straight cross-section look at the major departments for ease of access. Another, a geographical data base for the international department, takes the system's prime data base and redoes it to reflect a geographical area summary.

Within each area, North Africa or Asia Pacific, for example, the system can summarize the subsidiaries' affiliates and head office operations under one management structure, Maher said.

The fourth data base is an "institutional line-of-business" data base, in which the Sprids staff takes the management accounting structure of the bank and "strips off" all accounts and activities associated with the institutional bank line of business.

Maher explained that it is really more geared toward marketing than toward regu-

(Continued on Page 62)

Amcor Creates DDP System From Combined Software, Mini

PHILADELPHIA — Amcor Computer Corp. combined software with a minicomputer and introduced the entire package as a modular distributed data processing (DDP) machine at the recent Data Processing Management Association conference here.

The software portion of the product — dubbed Ambase/80 — is divided into two primary modules — the Ambase data base management system (DBMS) and applications software.

The DBMS module is particularly targeted to batch-oriented DP shops and offers various utilities, report writers and query facilities, according to Robert Bearden, marketing vice-president.

Applications are divided into accounting systems and business control systems and include the following packages: accounts receivable, accounts payable, general ledger, order processing/billing, inventory management and sales analysis.

Hardware for Ambase/80 includes Digital Equipment Corp. minis ranging in size from 256K bytes to 2M bytes of main storage.

Available immediately, an Ambase/80 system including a 256K-byte mini, 20M bytes of peripheral storage, operating system software, the file management, report writer and query facilities of Amcor's DBMS and applications software costs approximately $45,950.

Amcor is headquartered at 1900 Plantside Drive, Louisville, Ky. 40299.

In OS Environment

Fujitsu WP System Runs on 370

SCARSDALE, N.Y. — Fujitsu America, Inc.'s Word Machine Group has developed a word processing (WP) system for use on any IBM 370-compatible mainframe operating in an OS environment.

The Word Machine is comprised of a Fujitsu terminal, Dataproducts Corp. 45 char./sec printer and host software system operating inside the user's computer, according to a company spokesman.

The terminal, within which all WP functions are performed, reportedly can be expanded to 320K bytes of memory for multifunction use.

The Word Machine software reportedly requires about 400K bytes of resident memory to support a configuration of up to 40 terminals.

Inclusive in the software is an independent telecommunications network monitor, a text data base manager and an auto-indexing system. The Word Machine software is completely turnkey-installed on a user's computer.

The Fujitsu terminal costs $8,500; the Dataproducts printer sells for $3,500; and the software and one-time installation fee total $5,000 from the group at Two Overhill Road, Scarsdale, N.Y. 10583.

BP024
Advanced Software Design Techniques

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Beginning with fundamentals, this book gives all the techniques that will assure good—and simple—software design, including linear linked lists, binary trees, recursion, backtracking, formal methods of decomposition, and dynamic programming. Contains a valuable collection of illustrative programs to help readers produce better programs faster. $16.50

HP237
Introduction to Teleprocessing

James Martin

This volume presents an introduction to teleprocessing which is both comprehensive and enjoyable to read. The book discusses data transmission and how it is used. It explains the nature of the communication links and the hardware that is attached to them. It describes the codes, modems, terminals and methods of line organization. It explains the need for multiplexing and the types of network structures that are used. Software is explained, and the design techniques needed to implement the system are discussed. $21.95

BE125
Modern Project Management

Claude W. Burrill and Leon W. Ellsworth

A comprehensive book about data processing application development, presenting a project methodology designed to assist all levels of management in their efforts to achieve productivity, quality and worker satisfaction. $59.00

WJ129
Fundamentals of Data Communications

Jerry Fitzgerald and Tom Eason

An introductory book for people with little previous knowledge of data comm. Includes discussion of hardware, design methods, network configuration and control concepts. $20.95

WJ042
The Art of Software Testing

Glenford J. Myers

New ideas and techniques for finding and eliminating software bugs. Includes practical advice on the management aspect of testing, test tools, highest order testing, debugging and code inspection. Programmers at all levels will find the comprehensive information indispensible. $18.95

WJ143
Advanced ANS COBOL with Structured Programming

Gary Brown

This book does not deal with the elements of programming, but goes right to its task: teaching the basics of COBOL and simplifying many of COBOL's advanced features, including sort-merge, character string manipulation, report writer, indexed and direct files, communications facility and others. Emphasis is placed on structured programming as a way to simplified programming. $24.95

HP234
Security, Accuracy, and Privacy in Computer Systems

James Martin

Readable, well-organized and contains a wealth of information. This book offers some outstanding features: practical cost-conscious approach for the practitioner; detailed explanation of hardware and software controls, control of programming, control of terminal users; discussion of physical security requirements and administrative controls; the role and techniques of cryptography; concern for the impact of computers and data banks on society and the legal and societal controls that are needed. Over 100 lucid diagrams and many checklists. A complete set of class questions and exercises. $32.00

NV018
Data Processing Contracts: Structure, Contents and Negotiation

Dick H. Brandon and Sidney Segelstein

A detailed framework for structuring and negotiating airtight contracts that clearly stipulate the responsibilities of both user and vendor. More than 250 specific contract clauses included, with risk ratings and fall-back alternatives. $34.50

HM159
Elementary Structured COBOL: A Step by Step Approach, 2nd Ed.

Gordon B. Davis, Margrethe H. Olson and Charles R. Litecky

This is a problem-oriented approach to writing and maintaining well-structured programs in COBOL. Practice exercises in writing programs begin immediately so that the reader can grasp the fundamentals of COBOL through application. There is added emphasis on structured programming and disciplined program writing, as well as a more convenient explanation of the COBOL features pertaining to sample programs. $14.95

HM146
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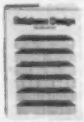

Gio Wiederhold

From hardware to files to database systems, this is a methodical approach to the principles of database design for commerce and industry, and the scientific disciplines. Throughout, theory is integrated with practical applications. Consistent terminology and theoretical models of immediate practical adaptability make the book particularly helpful for those just beginning their study of database design. $25.95

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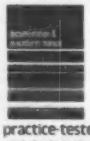
This volume explains real-time systems from the points of view of management, systems analysis, programming, and sales. The book discusses design, programming, testing, and implementation of real-time systems. In defining "real-time," Martin goes beyond a mere discussion of a real-time computer's essential characteristic (i.e., direct and immediate response to rapidly changing situations). Program testing and system build-up, which are particularly difficult on real-time systems, are discussed in detail. $21.95

HP186
Data Processing Documentation and Procedures Manual



Larry E. Long

Scores of standardized, practice-tested methodologies help you minimize the effort required to develop documentation procedures while maximizing effectiveness and usefulness of the final computer project. This manual brings you in-depth coverage of codocumentation and procedures in the DP environment—system development and implementation, general computer center documentation, and hardware and software evaluation. Plus, there are hints about intermediate, permanent, and project management documentation—space requirements, maintainability, redundancy, structural organization and personnel and much more. $21.00

HP199
Structured Systems Analysis: Tools and Techniques

Chris Gane and Trish Sarson

Here's a practical approach to the building of logical models for commercial data processing systems. With numerous flow charts, tools and step-by-step procedures, this guide brings you the "how" and the "what" of handling awkward notational problems and making the transition to a top-performance structured design. $22.50

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Randi S. Smith

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IC130
Application Design Handbook for Distributed Systems

Robert Patrick

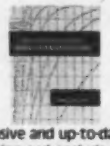
An excellent handbook for the practicing systems analyst, this book is a state-of-the-art approach to the mechanics of computer application design and an organized compendium of application design hints. It's a non-mathematical treatment based on firm data processing principles, and provides basic coverage of human factors, performance, distributed data and systems availability concepts that must be considered during the evolution of a successful design. Addresses economics of distributed computing and includes a checklist of 95 activities to be considered by the designer of a distributed system. $22.50

HM149
Information Systems Through COBOL, 2nd Ed.

Andreas Philippakis and Leonard J. Kazmier

This book uses COBOL as the programming language and as the vehicle for discussion of systems concepts. It includes comprehensive coverage of the COBOL programming language based on principles of structured programming that do not require any previous exposure to programming or computers. This book enables the reader to write COBOL programs almost immediately. This edition includes greater emphasis on the relationship between information systems concepts and techniques of COBOL programming. $19.95

HP236
Systems Analysis for Data Transmission



James Martin

The most comprehensive and up-to-date treatment of the design and analysis of data transmission systems. This indispensible handbook is in six sections: System Considerations, User Considerations, Terminal Considerations, Network Considerations, Software Considerations and Design Calculations. The last section occupies more than half the book and contains many worked examples. Many organizations with data transmission networks could halve their cost if all of the design alternatives were considered and appropriate computations were performed to select the best. With this in mind, the book lists the alternatives and provides programmed algorithms for comparing them and for optimizing network layouts. $39.95

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Programming with ADA

Peter Wegner

This is the first step-by-step introduction to ADA, the completely new programming language developed for use by the Department of Defense and all its suppliers. Featuring over 350 graduated examples, this book is a readable and comprehensive primer on the programming language that many experts feel is destined to become the FORTRAN of the 1980's. $13.95

HP203
Structured Design

Edward Yourdon and Larry Constantine

This new approach to designing programs provides strategies for designing the right modules and interconnections for the best possible solution to almost any problem—plus sound techniques for detecting design bugs. The authors take an in-depth look at new concepts of program and systems design, including coupling and cohesions, two new concepts they developed. $25.95

CHOOS 40 MO BOOKS

NV003
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Monte Jay Meidman, Dennis J. McLeod, Robert J. Pellicore, and Morris Squire

The first book to describe a complete minicomputer relational data base management system and its implementation. Coverage includes the design approach and structure, the user interfaces and how the system can be put to practical use. $14.95

IB055
Videotext: The Coming Revolution in Home/Office Information Retrieval

Edited by Efrem Sigel

As the 1980's unfold, new technologies and new economic forces are at work to turn the familiar television screen into a true information terminal, a phenomenon called videotext. This book provides a state-of-the-art report on what's happening in the U.S. and around the world in CEEFAX, viewdata, ANTIOPE, Teldon and related videotext systems. $24.95

HM152
Principles of Interactive Computer Graphics, 2nd Ed.

William Newman and Robert Sproull

This unified, comprehensive guide ranges from the essential principles of interactive graphics to a completely cohesive strategy for designing graphics systems. The authors include five complete chapters on raster graphics, as well as detailed information on user interface design, curve and surface manipulation and shading. The section on graphic output software takes the reader step by step through the different software elements that together form a device-independent graphics system. $26.95

CS121
The Basic Handbook

Dr. David A. Lien, author of the TRS-80 Learner's Manual

The publishers say that this book is an "encyclopedia of the BASIC language," that will help you "make those programs found in magazines work on your computer—or know the reason why they can't." If there is an alternate way to write a needed function that your machine doesn't have, this book will give you a subroutine to accomplish the same thing. If there is another way to write a program with different BASIC words, the book will show you how. $14.95

HP201
RPG & RPGII Programming: Applied Fundamentals: A Job Approach to Learning

William E. Bux and Edward C. Cunningham

Based on realistic business applications, this guide offers you a step-by-step development of 20 programming projects. You'll find ready-to-apply coding techniques relating to actual business concepts and easy-to-follow illustrated examples. You'll soon gain early programming success with the guide's wealth of source data and dozens of sample projects designed to give the programmer on-the-job practical experience. $16.95

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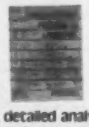
Computer Data-Base Organization, 2nd. Ed.

James Martin

Packed with the latest techniques for setting up your data base more efficiently than ever. You'll read practical methods for cutting down running time—correlating data base alternatives—and keeping up with growing storage demands. Multiple-use techniques optimize accessibility, flexibility and accuracy. Controlled redundancy plans simplify programs and operations while low cost methods of storing and using data minimize the cost of changes. $29.95

HP232



Programming Assembler Language

Peter Abel

This book is a concise, detailed analysis of ASSEMBLER, the efficient language that provides an alternative to languages like COBOL or PL/1. Each chapter covers a separate area of ASSEMBLER and includes sample programs, end-of-chapter exercises, and debugging tips to help newcomers to ASSEMBLER develop effective programming strategy. $16.95

WJ107

System/370 Job Control Language

Gary DeWard Brown

Gain a working knowledge of the concepts and facilities of the IBM System/370 operating system and Job Control Language (JCL). This book covers 90% of the System/370 facilities used by programmers, aside from their programming language. Both experienced and beginning programmers can benefit from this book. $14.95

CS122

Learning Level II

Dr. David A. Lien

This book covers Level II BASIC on the TRS-80, including a special section on converting Level I programs to Level II. It does not require a knowledge of Level I, however. It explores every important BASIC capability in detail, with the emphasis on learning how to use it, including the Editor, dual cassette operation, the real-time clock, printers and other peripherals. $15.95

HP214

Principles of Data-Base Management

James Martin

Slash searching and access time for quick, accurate output. This handbook provides the latest structuring techniques for simplifying and standardizing your entire data storage, helping you process ever-growing volumes of data in your system without costly software reconstruction. What's more, you'll see how to insure new accessability—foolproof security—and logical and physical data structures designed for complete independence. This comprehensive handbook covers every angle of data-base management. $25.00

HP206

Structured Programming and Problem-Solving with Pascal

Richard B. Kieburtz

PASCAL has been designated as the replacement for the current COBOL system and this new guide provides an all-in-one reference source with the latest techniques for perfecting your skills and insuring advancement in the programming field. Real-life examples help you hurdle day-to-day tasks—more efficiently define data types—and overcome syntax problems quickly. $14.95

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Martin L. Rubin

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HP188

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Edward Yourdon, Chris Gane, Trish Sarson and Timothy R. Lister

Whether you want a guide to the basics of COBOL, to accomplish techniques of structured programming or simply brush up on 1974 ANSI COBOL standard facilities, this guide is for you. This handy volume incorporates proven methods of structured programming to help you develop reliable COBOL programs. And frequent questions and exercises (with answers) and practical hints will help you achieve program efficiency and optimization. You'll see how to develop basic structures, use auxiliary storage and much more. $17.95

NV014

IMS Programming Techniques: A Guide to Using DL/1

Dan Kapp and Joseph F. Leben

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WJ040

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Melvin Silverman

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HP182

Managing The Structured Techniques, 2nd Ed.

Edward Yourdon

This updated guide is packed with practical methods for streamlining structured programming as well as important information helping the systems manager demonstrate the proven success of these methods for optimizing computer systems and programs. You get detailed coverage on the 5 basic structured elements—like, structured analysis, structured design, and structured programming—along with three aids for practical implementation. Read about management problems you may encounter, some specific solutions, and other practical management issues. $25.95

NV007

Encyclopedia of Computer Science

Edited by Anthony Ralston and C.L. Meek

The first and only one-volume computer science encyclopedia, with more than 480 articles and 1,000 illustrations, tables and charts covering every aspect of the discipline. It is divided into five broad areas: computer science, information processing, information sciences, data processing and symbol manipulation. Subdivisions include software, hardware, languages, programs, systems, mathematics, networks, applications, theory, history and terminology. $60.00

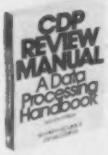
IIP026

An Introduction to Distributed Data Processing

Harry Katzan, Jr.

A thorough understanding of the most recent developments in data processing is provided by a graphic and comprehensive analysis of the current and future impact in planning and implementation procedures. The text is divided into three parts: Management Overview, Data Communications Concepts, and Distributed Systems Concepts with special emphasis on organizational changes, vital economic considerations, plus important selection criteria when choosing equipment. $20.00

NV004



CDP Review Manual: A Data Processing Handbook

Kenniston W. Lord, Jr., CDP and James B. Steiner, CDP

A handbook that encompasses all major subject areas in EDP and provides a complete review manual to help candidates prepare for the Certification in Data Processing (CDP) Examination. The handbook is specially designed for self-instruction and self-teaching by people interested in moving up the EDP management ladder. $19.95

HP192

Structured Analysis and System Specification

Tom De Marco

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SC084

Pascal: An Introduction to Methodical Programming

William Findlay and David Watt

This book is intended as a first course in programming. It assumes no prior knowledge of computing. It's based on the PASCAL language, and emphasizes programming principles, good style and a methodical approach to program development. An excellent introduction to PASCAL and a good introduction to programming in any language. $12.95

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Bits & Pieces

Matrix Printer/Plotter Gives 240 Line/Min

SAN JOSE, Calif. — Alphacom, Inc. has introduced a matrix printer/plotter that reportedly provides program control for up to 240 line/min of 40-char. lines utilizing a graphic 280 by n dot matrix.

The Sprinter 40's user-selectable interfaces include parallel; 7-bit Ascii, Strobe, Busy and ACK (Centronics standard) and serial; and RS-232 with selectable transmission rates of 110-, 150-, 300-, 600-, 1,200-, 2,400-, 4,800- and 9,600 bit/sec.

Sprinter 40 can be connected with the TRS-80, Apple II, Atari 800, Commodore Pet and all microcomputers using standard interfaces, according to the vendor.

The unit costs $390 from Suite 200, 3031 Tisch Way, San Jose, Calif. 95128.

Impact Matrix Printer Has Graphics Option

SALT LAKE CITY, Utah — Micro Peripherals, Inc., has announced the Model 88G impact matrix printer, which has a dot-addressable graphics option.

The Model 88G features 100 char./sec bidirectional or unidirectional printing with a short-line "quick cancel" feature, giving throughput rates of up to 150 line/min, the vendor said.

The graphics option produces printouts that can be varied through selection of one of four horizontal dot resolutions. Alphanumerics may be overprinted into the printout for labeling, according to the vendor.

The Model 88G with the graphics option costs $799, with pricing for large OEM quantities below $400, the vendor said from 2099 W. 2200 S., Salt Lake City, Utah 84119.

Merlin Introduces Micr Encoding Unit

WINTER PARK, Fla. — Merlin Equipment, Inc. has introduced a stand-alone magnetic ink character recognition (Micr) encoder.

The Merlin Document Encoder employs two daisy-wheel printers operating under computer control. The user can choose from a range of character sets and styles.

The running speed of the Merlin Document Encoder averages 1,250- to 1,500 document/hour, according to Merlin. It costs $69,020.

Merlin is located at 1160-70 Solana Ave., Winter Park, Fla. 32789.

Disk Subsystems, Tape Subsystem Bow

GRAND RAPIDS, Mich. — Three mass disk storage subsystems and a .5-in. magnetic tape subsystem are available from Cascade Data, Inc. They were designed to run with the vendor's Concept II and Concept III hard disk computer systems.

The disk subsystems, called the models 920-3, 920-6 and 92-15, range in capacity from 33.9M bytes to 67.9M bytes to 158.5M bytes, respectively.

The tape subsystem, the Model 921, includes power supplies, interfaces, cables and one of six streaming tape drives, the Model 424. The 424 has been designed for streaming data on the fly, at high speed, yet it can be used in nonstreaming applications, too, the vendor claimed.

The disk subsystems cost between $16,700 and $25,900 depending on capacity. Additional disk drives cost from $8,900 to $18,100.

The tape subsystem costs $16,200 with one tape drive, and additional tape drives are available for $10,600, the vendor said from 6300 28 St., S.E., Grand Rapids, Mich. 49506.

Fixed-Disk Drive Out

PHOENIX — The 10M-byte Series 4000 fixed-disk drive introduced by Western Dynex Corp. is a direct replacement and is interface-compatible with Control Data Corp., Perkin-Elmer Corp., Dynex and other cartridge disk drives, its vendor said.

The Series 4000 (at $1,650), in combination with the Dynex 10M-byte Series 6000 cartridge disk drive (at $2,100), allows system designers a means for low-cost system expansion to 40M-bytes in any combination of fixed-disk and removable-cartridge drives, the vendor stated.

Each drive has its own built-in backup and provides an alternative to Winchester drives in mini- and microcomputer applications, according to Western Dynex.

Western Dynex is located at 3536 West Osborn Road, Phoenix, Ariz. 85019.

Chase Manhattan Adds VAX to PDP-11 Data Base

(Continued from Page 59)

latory reporting.

The management information delivery department also creates tailored reports for more than 22 of the bank's departments.

Prior to Sprids, the management accounting data was distributed throughout the corporation's various departments via tape as well as hard copy. Various departments within Chase could then load these tapes on the bank's time-sharing system and generate their own tailored reports.

About three years ago Maher did a resource study for the controller's department with the goal of improving information delivery in the bank.

The bank tried to survey all of the current hardware and software with Chase's future as well as present needs in mind. What came out of that study was the use of Admins-11 software, a "very high-level development language."

Maher felt the Admins package was a potential key to efficient information delivery because the programmer can be more effective and productive with it.

Olivetti's 2030 FV Small Business Computer

Olivetti Brings Out Pair Of Small Business Systems

TARRYTOWN, N.Y. — Olivetti Corp. has introduced two small business computers, the BCS 2030 FV and the BCS 2025, each of which feature a CRT screen and storage capacity starting at 2M bytes of information.

Both systems are programmable in Basic and are intended primarily for use in general accounting applications. Unique to these systems is their ability to produce a hard-copy ledger record of account transactions when required by the user, Olivetti said.

The computers are available with from two to four high-density diskette drives providing a maximum of 4M bytes of storage. The BCS 2030 FV can be expanded to 20M bytes of storage with the installation of two 10M-byte hard disk units, according to the vendor.

Both systems incorporate a 1,920-char. CRT workstation with a screen that guides the operator through every step of the program and facilitates inquiry, Olivetti noted.

The difference between the two systems is that the 2030 FV includes an integrated, 100 char./-sec matrix printer, an 18-in. print line and can be expanded to hard disk storage while the 2025 cannot. Auxiliary printers, other peripheral devices and data communications capability are also available on both units.

The 2030 FV costs $14,950 and the 2025 costs $12,950. Turnkey application packages are also available from the vendor at 155 White Plains Road, Tarrytown, N.Y. 10591.

DEC Datasystem Paces Pump Maker's Growth

Special to CW

MONROEVILLE, Pa. — Growing companies sometimes find their rapid pace outstrips the ability of their small business computer to keep up to date. But that's not the case at Leybold-Heraeus Vacuum Products, Inc. (LHVP) here.

This small firm has more than doubled its business volume during the past three years, but its three-year-old, general-purpose minicomputer has been expanded as needed to keep up with the firm's explosive growth.

LHVP, a manufacturer and distributor of vacuum pumps, is a subsidiary of Leybold-Heraeus, located in the Federal Republic of Germany. During the past several years the U.S. firm's business has changed. Formerly only a distributor of the parent company's pumps, it now manufactures and distributes its product from the Monroeville plant.

In 1977, LHVP found its business expanding so rapidly that it quickly outgrew the manual methods in use. According to Gaetano Reano, manager of information services, "The manual system would have stalled out, or we would have had to hire too many additional clerical people to keep up with the work load." So the company computerized.

The decision to computerize was not taken lightly. A feasibility study was undertaken and directed by Ronald C. Southeimer, vice-president of finance. "Management considered both mainframes and minicomputers for the job.

Among the mainframes, IBM and Burroughs Corp. systems were examined, then dismissed from consideration because they were too expensive. Minicomputers from Digital Equipment Corp., Wang Laboratories, Inc., Data General Corp. and Datapoint Corp. were also discussed in management meetings. The firm finally decided on a DEC Datasystem.

Why DEC

"We chose the DEC minicomputer because we felt it gave us the best price/performance of any of the minicomputers we looked at. We liked the design of the DEC gear. You could start out with a basic machine and expand both the hardware and software without conversion problems," Southeimer said.

"We also needed an interactive processor that would allow both interactive and simultaneous file update by multiple users. The DEC system gave us that. And we wanted to deal with a manufacturer with a good reputation, which had enough equipment installed and which could support us and provide adequate service," Southeimer stated.

In addition, he said, DEC's method of selling its small busi-

(Continued on Page 64)

MDB, Spur Link IBM 1403, Series/1

ORANGE, Calif. — MDB Systems, Inc. and Spur Products Corp. are offering the hardware necessary to wed an IBM Series/1 computer with an IBM 1403 line printer.

To effect the system, the two companies employed a Spur controller, which performs all the control, logic and power functions of the 1403, with one of MDB's line of printer controllers.

The MDB controller is designed to operate the 1403. Because the Spur controller provides the universal character set capability for the 1403 model N1, the firmware in the MDB controller was modified to implement this feature with the Series/1.

MDB is selling the line printer controller for $1,995. Spur is selling the device in combination with its controller for $20,000, and Spur sells the completely refurbished 1403 N1 printer for $12,000.

MDB Systems, Inc. is located at 1995 N. Batavia, Orange, Calif., and Spur Products Corp is located at 1904 Centinella Ave., Los Angeles, Calif.

CA Additions Include Naked Mini Languages

IRVINE, Calif. — Three high-level programming languages for Computer Automation, Inc. Naked Mini 4 series computers, a mass storage capability for the Scout microcomputer and an "intelligent cable" interface have been introduced by the firm.

The compilers are for Pascal, BCPL and Coral 66, according to the firm. The Pascal compiler, based on the ISO standard, has extensions for real-time and multitasking operations, and can communicate with modules written in other languages.

All three compilers execute under both the OS4 and RTX4 (real-time executive) operating systems. BCPL is a system implementation language said to be suited for real-time applications; it can replace assembly language or be used in combination with assembly language subroutines.

BCPL also reportedly can call or be called by other program modules and pass data between modules, according to a spokesman.

Coral 66, a procedural language designed initially for UK defense applications, is the simplest of the three compilers. Like the Pascal and BCPL compilers, Coral 66 is block-structured and recursive.

Its data types include constants, signed and unsigned integers and floating point real numbers. It can be linked to programs written in the Naked Mini Pascal, BCPL or assembler.

The mass storage capability for the Scout Naked Mini 4/04 computers consists of a dual-sided, double-density floppy disk subsystem. The dual-drive Scout Quad Floppy subsystem has a formatted-data capacity of 1M byte per drive.

The "intelligent cable" interface is said to facilitate computer-to-computer communications under DDCMP protocol, which was selected last year for the firm's Intracomm real-time communications subsystem.

The microprocessor within the cable reportedly transfers data, manipulates device control signals, monitors device status and handles computer interrupts.

Prices for the products are as follows: Pascal compiler, $2,500; BCPL compiler, $2,000; Coral 66 compiler, $2,000; Scout floppy disk subsystem, $3,950; and "intelligent cable," $160.

CA is loacted at 2181 Dupont Drive, Irvine, Calif. 92713.

DEC Datasystem Keeps Pace

(Continued from Page 63)

ness computers through independent resellers assured LHVP of a supplier that could develop and implement appropriate application software.

The Datasystem at LHVP includes a PDP-11/34 CPU with 256K bytes of main core memory, two 28M-byte RK07 disk drives, one fixed and one removable RK05 disk drive, three CRT terminals (with three more on order), one 300 line/min printer and one 180 char./sec printer.

The system operates under the CTS-300 operating system, but the company expects to upgrade to CTS-500 within the next few months.

LHVP is upgrading operating systems because CTS-500 will support more peripheral equipment and more languages, allowing the company a wider range of applications packages from which to choose.

The applications running at LHVP include order entry, inventory control, payroll, general ledger, accounts payable, job costing and bill of materials processing. All applications were purchased as packages through Pittsburgh, Pa.-based Mesta Computer Services, Inc., an authorized DEC distributor.

"Everything but the bill of materials processor was part of our original installation and was written by Mini-Computer Business Applications, Inc. in Los Angeles," Reano recalled. "The bill of materials processor was written by a DEC OEM in Connecticut called Computer Covenant Corp."

In all cases, LHVP selected the application package that would best fit its business, "then we had Mesta modify it to suit our requirements," Reano explained. All of the packages were written in Dibol DEC's business programming language.

Reano considered the most important module installed to date to be the inventory file control system. "Prior to installing this system, we had a classical card-oriented system. You had a card in a tub for each of your parts numbers, and you recorded the various types of inventory activity manually on the card."

Now when an order comes in, the Customer Service Department reviews the stock status and compares customer requirements with actual material availability. Once the order passes that check point, it is written up and entered into the system.

The computer reserves the materials, updating the inventory master file and also updating the backlog file. When the order is finally shipped, a billing notice is received by the billing department from the shipping department. The billing department calls up the order for billing, either on a full or partial basis, and orders the system to print an invoice.

The printing of the invoice updates the backlog file and also updates the inventory file by reducing the quantity on hand.

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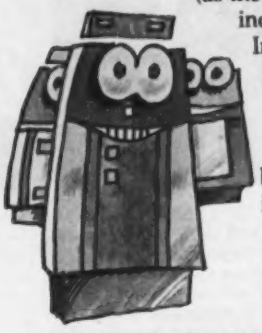
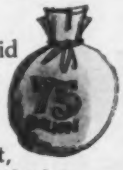


In only thirty years the industry has gone from the development of the giant Eniac system, through the tube-powered, water-cooled Univac I (the world's first business computer), to the incredibly cheap, battery-powered microprocessor.

But as unbelievable as the last 30 years have been, the next 30 will probably be even more incredible. Right now, IBM has begun delivery of a new computer series that will, by itself, provide four times as much processing power as all the previous computers delivered by the company. And they have announced a new "superconductor" that could improve computer speed and performance by a factor of 500 in the next seven years! It's hard to remember this is real science, not fiction.

This extraordinary increase in efficiency has led to a rapid expansion in computer use, as human ingenuity finds more and more applications for these powerful tools. So the market for computer products and services has turned out to be more elastic than most observers had thought. Worldwide expenditures are currently at $75 Billion, and growing by 20% a year.



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Our oldest publication is *COMPUTERWORLD*, a weekly newspaper with a growing all-paid circulation in excess of 105,000 (quite an increase from our modest 7,500 in 1967).

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But Not Other Mainframers

Analyst Predicts 3081 Will Hurt PCMs

By Marcia Blumenthal
CW Staff

The recent announcement of the 3081 will have a positive effect on IBM and be neutral for other mainframers, but will probably hurt the plug-compatible manufacturers (PCM), according to one Wall Street analyst.

The launching of what had been known as the H series set the tone for products IBM will introduce during the decade, although it will not kill off outright sales or conversions, according to William D. Easterbrook, a vice-president with Kidder, Peabody & Co. Easterbrook predicted IBM will deliver about two dozen 3081s to customers during the first half of 1981; the delivery date was pegged by IBM for the fourth quarter of next year.

The delivery time will be shorter for the 3081 than for other products, he observed, adding this signals an alleviation of production buildup problems IBM has been experiencing.

On the other hand, Easterbrook sees some problems in the wings for the PCMs because of new ways of executing microcode in the 3081.

While IBM has not been too explicit about its engineering changes, it has put more of the microcode out in the channels, Easterbrook explained.

IBM is making it increasingly easier to change the interface between the operating system and the hardware, which could spell trouble for the hard-coded PCM offerings, most notably those of Amdahl Corp. and National Advanced Systems, he contended.

Moreover, some observers have interpreted the 3081 as a signal that IBM will compete vigorously with Japanese computer makers. At Hitachi Ltd., Katumi Fujiki, group executive of the Computer Group, said his firm would be able to compete with IBM's new H family by increasing the performance of the M200H.

Others OK

While the 3081 may portend trouble for the PCMs, other mainframers should be in pretty good shape. "They've had powerful systems waiting in the wings," Easterbrook noted.

Univac is nearly into the fourth year of development of an upgrade for its high-end 1100/80 system, noted H. Glen Haney, its vice-president of world marketing.

"Nothing in this announcement changes the plans of what's already in our laboratories," he said. Univac's 1100/84 system is in the range of 7.5 million to 8 million instructions per second (Mips), which is not too far off from Univac's initial estimate of 9 Mips for the 3081.

However, any announcement of a new high-end system will be paced against the company's as-

(Continued on Page 70)

While Foreign Firms Profit

Productivity Seen Haunting Vendors

By Tim Scannell
CW Staff

ORLANDO, Fla. — The computer industry has grown by technological leaps and bounds, but has yet to face its greatest enemy — decreasing productivity.

Battered by a sluggish economy, high interest rates and other by-products of "stagflation," U.S. computer makers — especially smaller companies — are sacrificing research and development efforts in order to stay financially afloat — and the wolf is at the door. The Japanese electronics industry, with its higher rate of productivity, is already threatening to give U.S. manufacturers a run for their computer money.

So far in the U.S., "there has been more talk than there has been action," Rep. Stanley Lundine (D-N.Y.) said at the fourth annual meeting of the Data Entry Management Association (Dema) here recently. Lundine is from New York's 39th congressional district and is a member of the House Banking and Finance Subcommittee. He is also a member of the recently formed House Science and Technology Committee.

Calling computers a "sunrise industry" that "may not have come to grips with human and productivity problems," Lundine cautioned both labor and management to work together to eliminate productivity roadblocks.

In particular, he asked managers to focus on people as well as technological and financial resources. "When you're in a time of transition, by concentrating on the human resources part of productivity, you can make great improvements," he stated.

Speaking to a packed audience of data entry managers at the conference, whose theme was "Improving Productivity and the Quality of Working Life," Lundine hinted that the industrial revolution may have run its course. America's industrial "backbone" has "atrophied almost like a muscle put in a cast," he said, noting that since 1974, productivity has all but abated and actually declined last year.

Politically and industrially, the U.S. is in the midst of an enormous transition, and the productivity issue is at the center

(Continued on Page 72)

Deltak Sues Former Employee, ASI

OAK BROOK, Ill. — Deltak, Inc. has filed suit in the Circuit Court of Cook County, Ill., against a former employee and a competitor to prohibit the use of confidential Deltak information that the suit charges was obtained by the former employee during a Deltak management meeting last month.

The defendants in the suit, which is seeking $1 million in punitive damages, are Advanced Systems, Inc. (ASI) of Arlington Heights, Ill., and Paul Pinney, formerly a Deltak national account manager.

ASI has agreed not to use any alleged confidential information and to return original documents obtained by Pinney pending the outcome of the suit, reported R.E. King, Deltak's president.

October Meeting

In its suit, Deltak alleged Pinney attended an Oct. 24 meeting of the company's management-level employees at which confidential marketing and product development strategies for 1981 were presented. Both Deltak and ASI specialize in multimedia training programs primarily for the DP industry.

On the following Monday, Pinney resigned from Deltak, becoming an employee of ASI.

This sequence of events convinced Deltak it was necessary to file suit to protect the confiden-

(Continued on Page 70)

Former Computervision Exec Hit With Trade Secret Suit

BEDFORD, Mass. — A former vice-president and assistant secretary of Computervision Corp., Phillipe Villers, is being sued by that firm for allegedly using trade secrets after he left the company last December.

The suit charges Villers and Automatix, Inc., a robotics company which he had formed, with "wrongful appropriation of corporate opportunities." According to the filing, Villers was given responsibility for starting a robotics division while employed by Computervision, but intentionally frustrated that company's attempts to expand into the robotics business.

Villers was also charged with coercing five Computervision employees including Michael Cronin, another vice-president, into leaving the firm and joining Automatix.

In response to a Computervision claim that it had made appropriations of $400,000 to him for the robotics venture, Villers stated that Computervision never gave him the money and in fact rejected the idea of entering the business when he had proposed it to the company in April of last year.

Computervision insisted that it was developing robotics technology as an integral part of its industry automation business.

IBM 3081 Introduction Expected to Hurt PCMs

(Continued from Page 69)

sessment of user demand for large systems. Right now the market does not really require the power of the 3081, Haney maintained.

Much to Univac's surprise and delight, the 3081 did not create a new price/performance curve, Haney said, adding that while there is a new curve for the 30 series, it is not anywhere as radical as the one established by the 4300 announcement.

Honeywell, Inc. also responded to IBM's 3081 with a "no surprise" comment. The system contains no reason to modify the company's product plans or pricing, noted Stephen G. Jerritts, president of Honeywell Information Systems.

Jerritts said Honeywell is committed to large systems, but he declined to comment on any forthcoming offerings, pointing out that some members of the DPS 8 line already approach the power range of the 3081.

While noting the reduction in maintenance charges for hardware and software, Honeywell said the decreases were really minimal because the old prices were too high.

Firm Files Suit To Protect Data

(Continued from Page 69)

tiality of the information. "Our business is of such a nature that our competitors would have a significant advantage in the marketplace by knowing our plans and strategies," King noted.

'Good Evidence'

"This is the first suit we are involved in and we would not have filed suit if we didn't have good evidence," King asserted.

King claimed that over the past several months ASI had made contact with "the greater percentage of our marketing and educational services staff," eventually hiring away four people. Likewise Deltak has hired about five former ASI employees, but King maintained Deltak management told those employees the company did not want any confidential information about ASI.

John DeAno, president and chief executive officer of ASI, could not be reached for comment on the suit, but in an earlier public statement claimed the suit was "completely without merit" and said his firm's counsel would vigorously defend the company.

WP Shipments Top $1 Billion in '79

Study Sees Healthy Growth in OEM Mini Sales

WALTHAM, Mass. — Word processing (WP), process control and photocomposition were the most lucrative market areas for OEM minicomputers in 1979 and promise to grow 30% to 50% in each of the next three years, according to a research report compiled by International Data Corp. (IDC).

Overall, the OEM minicomputer market generated revenues of approximately $4 billion last year. The WP market shipped some 60,000 units valued at $1.1 billion, while process control generated $700 million in revenues and photocomposition checked in at $400 million, the report, "OEM Minicomputer Market," noted.

Together these three markets accounted for approximately half of all 1979 OEM revenues in the application areas reviewed by IDC. For each of the other application areas — automatic testing, computer-aided design (CAD), data acquisition, factory data collection, materials handling, message switching, energy management, numerical control and security — 1979 sales were between $100 million and $300 million.

Combined growth for these OEM markets will be approximately 25% over the next three years, IDC predicted, adding that prospects for WP, CAD and energy management are particularly bright — averaging some 30% to 50% growth per year.

For other application areas, relatively moderate growth of 15% to 20% was forecast.

Common Factors

While the OEM markets mentioned above are varied, there are some similarities that cut across all application areas, IDC said.

System reliability is important to all OEMs and was a strong if not the primary criterion for selection of a CPU, according to the market research firm. This concern is easily understood, since in most OEM applications the CPU is controlling a system that is essential to the entire industrial operation, the report pointed out.

Another common feature across OEM markets is the tendency for OEMs — particularly the large ones — to take responsibility for hardware maintenance. While manufacturer-supplied maintenance may be useful as a backup, the necessity for rapid response pretty much dictates that the OEM provide most of the support. Those large OEMs that buy peripherals from independent suppliers and can support a substantial field maintenance force, in particular, are taking on more of this maintenance responsibility, the report noted.

Digital Equipment Corp. is the leading supplier to each of the OEM markets examined in the course of IDC's research. Data General Corp. is in second position, although it is vulnerable (given its emphasis on large OEM sales) to vertical integration by the OEM into manufacture of its own CPUs, IDC said.

Computervision Corp., the market leader in CAD, is an example of an important OEM that switched to self-manufacture of its CPUs. Other important hardware suppliers include Hewlett-Packard Co., Modular Computer Systems, Inc. and IBM.

Several others are big in certain markets, including Computer Automation, Inc., Honeywell, Harris Corp., General Automation, Inc. and Perkin Elmer Corp.

What IDC found, however, is that being the dominant supplier in a particular market does not necessarily mean an advantage in approaching new OEMs in that market. Reliability, maintenance, and other company-specific factors are more important than a supplier's share of any given market, the researcher maintained.

There are two major technological trends that may have a significant affect on the various OEM markets. The first is the trend toward the increased use of microprocessors, either in place of a mini CPU or in conjunction with it to provide "distributed intelligence" to the system — thereby reducing the demands on the central processor.

Microprocessors play a particularly significant role in process control and security systems, where they are displacing the use of minicomputers to a significant extent.

The second major trend is toward increased system functionality and complexity. In these cases, increased central processing power is required as systems functions expand. This trend is noticed in the area of computer-aided design and in data acquisition.

"OEM Minicomputer Market" costs $2,500 from IDC's Corporate Planning Service, 214 Third Ave., Waltham, Mass. 02254.

Mostek 64K RAM Set for December Sampling

DALLAS — Mostek Corp. has entered the 64K dynamic random-access memory (RAM) market with the introduction of the Model MK4164.

Because of such features as the Direct Step-on Wafer Projection printing technique, which never touches the surface of the wafer, and the use of polysilicon diffused bit lines, Mostek claimed the MK4164 is more manufacturable and able to be produced in greater quantity.

The combination of these new designs and fabrication technologies gives the corporation a feeling of security over its major U.S. competitors — Texas Instruments, Inc. and Motorola — as well as competition from Hitachi in Japan, Mostek said.

The MK4164 is slated for limited sampling on Dec. 1.

The units will be generally available in quantity sometime in the first quarter of 1981, the vendor said.

Ergonomics Seen Taking Terminal Market Limelight

ANAHEIM, Calif. — The proliferation and higher usage rate of CRT terminals coupled with the growing sophistication of terminal users is forcing manufacturers to pay strict attention not only to applications, but also to human engineering factors, according to an industry executive.

Ergonomics has come into the limelight largely as a result of recent studies conducted by the National Institute for Occupational Safety and Health, John Ludutsky, director of marketing at Lear Siegler, Inc.'s Data Products Division, said at a recent conference here.

"These much-publicized studies discovered that employees using CRT terminals regularly appear to have more health complaints than those not using terminals frequently," Ludutsky continued. "The alleged problems are mostly visual in nature, but these are also reported to lead to other physical ailments, such as backaches, neckaches and similar muscular discomforts.

"The problem, however, does not lie entirely with the terminals; they are only a part of the whole workstation design. Anytime a person sits in one position all day, comfort inevitably becomes a major concern for productivity as well as health," Ludutsky stated.

"Lighting, the angle of the equipment, desk and chair height are all important components that must be analyzed. The science of ergonomics, therefore, has been and should continue to be stressed by manufacturers of all office equipment. Because terminals are the operator's direct link with the computer, however, they have received far more attention that other components," he observed.

With that in mind, terminal manufacturers have begun to move aggressively beyond price/performance features to focus on meeting this new demand, the executive pointed out. As a result, more and more terminal models now offer ergonomic characteristics as key features of their products.

"And, although terminal users have created the demand for ergonomic features to enable them to perform their tasks more effectively and comfortably, there is evident confusion among them as to when they should implement ergonomic terminals and which ergonomic features are most important for their particular requirements," Ludutsky emphasized. "This is largely due to the inevitable bottom line — cost — because human engineering features are in many respects luxury features. The need for physical comforts they provide must therefore be weighed against the expense factor."

In order to help solve this user dilemma, Ludutsky divided the broad base of CRT terminal users into two categories based on usage rate: casual vs. extensive. "An ergonomic terminal should not be too great a priority when operators are only performing a couple of entries a day," he explained. "Yet in those applications where terminals are the main tool of an individual's job, operator comfort becomes a key concern.

"Once it has been determined that ergonomic features are required, the next step is to select which of those features are most critical. Just as terminal manufacturers offer a wide range of models with a myriad of performance features, terminals are also on the market with a variety of ergonomic characteristics. The user does not necessarily need an ergonomic terminal that is 'loaded.'"

Productivity Woes Cited

(Continued from Page 69)

of the storm. By improving worker productivity, Americans not only battle inflation, bolster the weakening dollar and expand employment, but also establish a common goal which "provides a crucial glimmer of light at the end of the tunnel."

Turning to the political scene, Lundine said although President-Elect Ronald Reagan will probably not bail out single major failing businessess — a la the Chrysler Corp. — he will push to revitalize important industrial areas. In fact, a new "buzzword" — reindustrialization — that arrived in Washington, D.C., on the coattails of the new President promises that the new administration will look at the economy on a sector-by-sector basis with an eye toward improved productivity, the congressman explained.

However, the productivity reversal thrust will not be easy, Lundine added, quoting an MIT economist as saying that the economy is "not like one big wound, but like many small cuts."

Pointing to his previous experience as mayor in Jamestown, N.Y., where he faced and reportedly solved a smaller scale productivity problem, Lundine noted that the private sector's battle against nonproductivity cannot be won without the government's help.

In the coming months, Congress will work on passing accelerated depreciations laws that make it easier to acquire the latest in computer equipment. At the same time, both houses will move toward reducing unnecessary social regulations.

In the same vein, Congress will establish a rule that if a regulation is imposed on the private sector by a federal agency, that agency will have to figure out the bottom-line costs to corporations and whether the regulation acts as a barrier to improved productivity, Lundine observed.

Finally, the congressman told his audience that more effort will be made to work with colleges and universities as well as with smaller firms that may be short on equity capital, but long on research and development ideas.

To underscore his last point, he noted two technology-aimed bills are currently in committee and under consideration by both the Senate and House of Representatives. The first one, the Small Business Innovations Act, will grant financial assistance to smaller high-technology firms that have great ideas, but do not know how to finance them. The second bill, the Technology Foundation Act, will promote better coordination among different firms and move toward major new developments under a single umbrella. Both bills are being sponsored by Lundine.

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Frank J. Sanzone, Jr., Carroll County General Hospital

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Frank J. Sanzone, Jr., is Assistant Director of Finance, Carroll County General Hospital, Westminster, Maryland. Robert Monogue is an NCR Representative.

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Mergers/Acquisitions

M/A-COM, Inc. has acquired **Prodelin, Inc.** of Hightstown, N.J. Prodelin shareholders will receive 180,000 shares of M/A-COM common stock at an exchange ratio of one share of M/A-COM for 1.83 shares of Prodelin.

On-Line Business Systems, Inc. has acquired the **Computer Utility Division** of Optimum Systems, Inc.

Comserv Corp. has bought the computer processing customer base of Accounting Associates Data Center, Inc.

Tymshare, Inc. has signed a letter of intent to purchase the **Capital Credit Corp.**, a subsidiary of Union Corp. in Verona, Pa., for an undisclosed amount.

Datascore Systems, a division of the Westinghouse Learning Corp., has acquired the assets and business of **Information Associates, Inc.**

Aregon Group, Inc. has acquired **Swift Computer Services** of Chicago.

Zilog Chief Goes to Exxon; Fernandez Named President

CUPERTINO, Calif. — Manual A. Fernandez was elected president and chief executive officer of Zilog, Inc. and named a director of the company at a special board meeting earlier this month.

Fernandez's appointment was taken in conjunction with an announcement by Exxon Enterprises, Inc. (EEI) naming Federico Faggin, Zilog's former president and chief executive officer, to the post of vice-president of EEI in charge of the Computer Systems Group.

Zilog is majority-owned by EEI, with the remaining shares held by a small number of individuals, primarily employees and former employees of the company.

Last year Zilog's sales reached $34 million, and this year sales will be "comfortably ahead of that figure," Fernandez noted.

Other Moves

• In an internal reorganization at Point 4 Data Corp., Paul Davies has been named president of that organization; Geza Gorgenyi, executive vice-president of operations; Dan Paymar, vice-president of staff; Catherine Davies, secretary/treasurer; John Mather, vice-president of marketing; Robin Ollivier, vice-president of sales; Renny Bosch, vice-president of engineering; Max Heller, vice-president of software support; and Lou Smith, controller.

• Dale F. Pilz has been named to the newly created position of executive vice-president and general manager of Southern Pacific Communications Co.

• Robert S. Bernstein has been elected director, president and chief executive officer at Compuscan, Inc.

• Five new vice-presidents of marketing were announced by an Amdahl Corp. spokesman: Clifford Rudolph, headquarters; Thomas McKenna, western region; Joseph Francesconi, north central; Ollie Nutt, south central; and Milton Nelson, eastern region.

• Richard Fisher has been appointed vice-president of finance and treasurer at Network Systems Corp.

• W. Clay Matthews has joined Pertec Computer Corp. as senior vice-president and general manager of the Peripherals Division, and Richard A. Hahn has been named corporate vice-president and general manager for the Systems Marketing Division.

• James W. Ashbrook has been promoted to the position of vice-president of systems marketing at National Advanced Systems.

• Informatics, Inc. has promoted Douglas Salmon to vice-president of business development and institutional marketing, Dominick Ciminello to vice-president of production services for data services operations and Richard Kaylor to vice-president of the data services group. Victor Martinelli has been named vice-president of finance and administration and chief financial officer.

Executive Corner

• Donald L. Sink has been appointed vice-president of marketing at California Computer Systems, Inc.

• Ken Hessinger has been named vice-president of time-sharing services at National Information Systems, Inc.

• John D. Seiley has been elected vice-president of engineering in the Applied Technology Division of Computer Sciences Corp.

• Gregory Liemandt, president of General Electric Information Services Co., has been elected a vice-president of General Electric Co.

• Peter J. Fenchel has been appointed vice-president of finance at Omnidata, Inc.

• Richard Ottaviano has been elected to the newly created post of vice-president of personnel at Century Data Systems, a Xerox Corp. company.

• James Fletcher has been named vice-president of sales for the Minicomputer Division of Data Communications Corp.

• John Bartolo and James Hanly, both former product sales managers for Continental Information Systems, Inc. have been named vice-presidents.

• Gary Hughes has been appointed president and chief operating officer of Benson-Varian, Inc.

• Donald G. Burgar, president of Elgar Corp., upon his retirement this month, will be succeeded by Joseph P. Gibbs.

• Rich Brechtlein has joined Cobar, Inc. as vice-president of marketing, where he will oversee sales and marketing for the firm's Model 3132 Digital Equipment Corp.-emulating CRT terminals.

• Thomas K. Shaffert has been made a vice-president at Shared Medical Systems Corp., where he will be responsible for its Physicians Services Division.

• M.E. Stever has been elected vice-president of customer service, a newly created position at General Automation, Inc.

• Kim Ehler and Kevin Frey have been elected vice-presidents at Cubic Data Systems, Inc.

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At Oakland University, our Level 68/DPS is used for everything but French Club breakfasts.

Michigan's Oakland University wanted its computer system to be open to everyone–particularly students.

So they installed our Level 68/DPS.

Equipped with a powerful Multics operating system, the computer is available to students 16 hours a day.

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Processing power can be tapped right in the classroom. Or through more than 70 terminals scattered across campus.

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Because the Level 68/DPS is an interactive system, administrators and secretaries can also benefit by it.

Naturally, with so many people using the computer, security is essential.

But thanks to extensive safeguards built into the Multics operating system, security can be maintained without lessening the computer's availability.

All in all, Oakland's Level 68/DPS is working out very well.

Most Oakland students will graduate with the ability to use a computer. A necessary skill in our increasingly technological society.

There's a lesson here.

What could be more appropriate for *any* university than distributed computer power that's easily accessible and easy to use?

For more information on the Level 68/DPS and the Multics operating system, write Honeywell, 200 Smith Street (MS 487) Waltham, Massachusetts 02154.

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The Dialogue 80 is one tough competitor. Comparing our interactive, desk-top editing terminal to most other terminals costing hundreds of dollars more is very revealing.

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Nickels & Dimes

Computer Automation, Inc. has obtained a $12 million unsecured four-year credit line from United California Bank at an interest rate of 105% of the bank's prime rate.

$$$

Tymshare, Inc. has announced a two-for-one stock split effective Dec. 1.

$$$

Micro Peripheral, Inc. has secured a $3 million loan from United California Bank to retire higher interest loans from smaller lenders and to expand production output and new product development.

$$$

Apple Computer, Inc. has filed a registration statement with the Securities and Exchange Commission to make 4.5 million shares of common stock available.

$$$

Micropolis Corp. has obtained $2 million in additional financing through private placement of common stock.

$$$

The board of directors at **Automatic Data Processing, Inc.** has declared the regular quarterly dividend of 19 cents per share, payable Jan. 1 to stockholders of record Dec. 16.

$$$

Computer Sciences Corp.'s directors have authorized the repurchase of up to $2.5 million principal amount of the company's convertible debentures to meet a sinking fund requirement due Sept. 15, 1982.

The board of directors of **CGA Computer Associates, Inc.** has declared a 50% stock dividend, which has the effect of a 3-for-2 stock split, to be payable Nov. 24 to shareholders of record Nov. 10.

$$$

Data Terminal Systems, Inc. has sold $8 million in subordinated debentures, $4 million each to Connecticut General Life Insurance Co. and Massachusetts Capital Resource Co.

$$$

Texas Capital Corp. has arranged and participated in a $1.7 million financing for Telxon Corp. of Bath, Ohio, producers of portable data entry terminals and accompanying software and support systems.

Supershorts

Battelle, Inc.'s Columbus Division has established a center for developing I/O models used in economic analysis and forecasting. Prof. Wassily W. Loentief, a Nobel laureate in economics, will advise the new center.

The Association of Data Processing Service Organizations has moved its headquarters to Suite 300, 1300 N. 17 St., Arlington, Va. 22209.

The recently reactivated Applied Technology Center at the University of Massachusetts in Amherst is seeking solutions to industrial problems under the direction of Dr. David Navon.

Data General Corp. has established an Asian marketing operations office in Hong Kong to provide direct sales and support to that market.

Contracts

Applied Communications Networks, Inc. has been awarded a contract by the Corporation for Public Broadcasting to identify and evaluate available interactive technologies that would enable TV viewers to respond to programs from their homes.

The Librascop Division of the Singer Co. has received a $4.3 million contract from the U.S. Army's Communications Research and Development Command to develop the triservice Single Subscriber Terminal that would reduce communications time in tactical warfare environments.

Diva, Inc. won a $500,000 subcontract from the Link Division of the Singer Co. for the Diva Computroller V Series DD-4300.

Univac Defense Systems Division has been awarded a $10 million contract for the development of the AN/-UYK-44 (V) computer system for the Naval Sea Systems Command, Washington, D.C. This three-year contract is the first awarded for the Navy embedded computer system development effort.

Nixdorf Computer Corp. has signed a $2.1 million contract with CISI Group, Inc. for the installation of 35 Nixdorf 8840 word processing systems to be used for a variety of applications, including compilation of mass mailing lists and typing of catalogs and legal contracts.

POSITION ANNOUNCEMENTS

Computer

Computer Sciences Corporation

Opportunities at the Software/Hardware Interface —from both directions.

If you've been under the impression that systems software upstages systems engineering here, you're probably not up to date on the contract mix at CSC Systems Division.

Turnkey systems.

More and more, turnkey systems are bringing together our software systems engineers and our hardware systems engineers, along with the programmer/analysts and the hardware designers, in complementary teams.

What most of us quickly discovered is that working at the software/hardware interface can be considerably more challenging, and certainly more interesting, than working in a narrow, rarefied software environment exclusively, or in a strictly hardware development-oriented atmosphere.

And we're proud to say that the track record of our people has proven that when the best systems software specialists can collaborate with the best systems engineers... virtually anything is possible!

THE SOFTWARE SYSTEMS SIDE

Includes opportunities at all levels for programmer/analysts fluent in:

COBOL • FORTRAN • HP ASSEMBLER • PL-1 • TOTAL • PASCAL • ASSEMBLER...

and experienced with

HP 1000, HP 3000, HP 21-MX, SYSTEM 2000, UNIVAC 1108/1100, H LEVEL 6, PDP 11/70, H-6000, IBM 360/370, TANDEM

AN-UYK-14 EXPERIENCE?

A number of important new openings call for individuals qualified to do software development on militarized systems involving the AN-UYK-14. You should have 8 to 10 years of experience using CM^2 and be willing to undergo a rigorous background review.

THE HARDWARE SYSTEMS SIDE

Includes opportunities at all levels for systems and design engineers qualified to contribute to these systems and tasks:

SPREAD SPECTRUM COMMUNICATIONS • DIGITAL COMMUNICATIONS SYSTEMS DATA NETWORKS & PROTOCOLS • SYSTEM CONTROL • REAL-TIME SYSTEMS MANAGEMENT & PLANNING • SOFTWARE VERIFICATION & VALIDATION MESSAGE SWITCHING • SATELLITE COMMUNICATIONS • TRANSMISSION & COMMUNICATIONS PROCESSING • INTEROPERABILITY • SYSTEMS TESTING HARDWARE REQUIREMENTS ANALYSIS

For more details and immediate consideration, please forward your resume to The Director of Professional Staffing, Dept. **MC/218-KK.**

The only limitations are the ones you bring with you.

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SYSTEMS DIVISION
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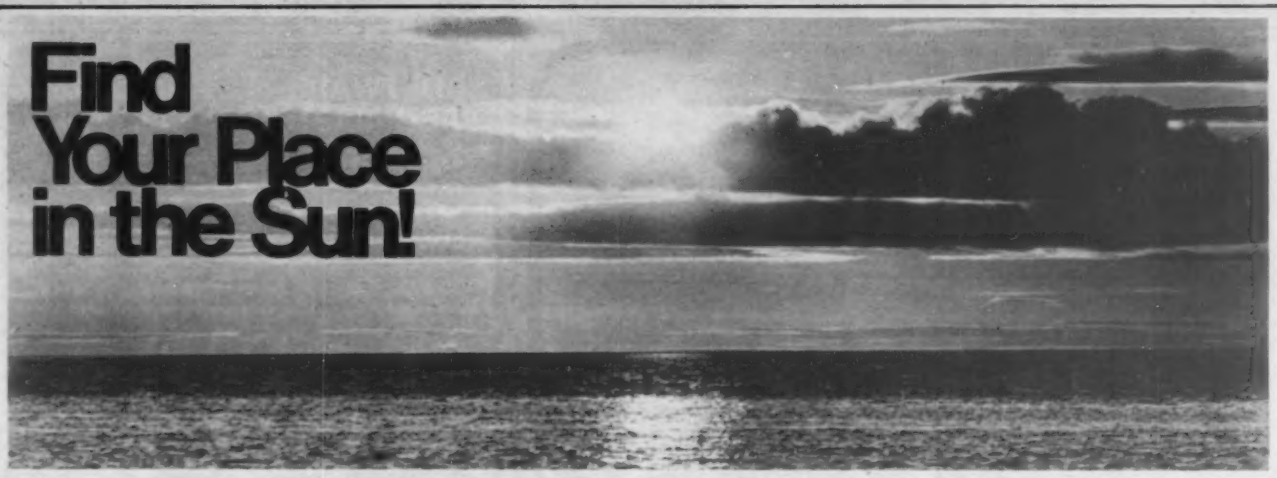

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(Call today, tonight or this weekend. Our toll free lines are open 24 hours a day, 7 days a week. In Missouri, call 1-800-892-7655 x326.)

If you're tired of snow, ice and escalating living costs, take advantage of the challenging opportunities now available in the Southeast. Record industrial growth in Florida, Georgia and the Carolinas has created unparalleled demand for computer professionals at all levels. In addition to computer sophistication, the Southeast offers you:

- A sunny, warm climate for year around outdoor living.
- Over 4,000 miles of ocean shoreline and hundreds of fresh water lakes.
- Easy access to some of the best skiing and winter sports areas in the country.
- Outstanding cultural and educational facilities.
- A substantially reduced cost-of-living where your dollars will go farther.

If you'd like detailed information about Southeast opportunities in confidence, call Source Edp today. With 56 offices in North America (including facilities in the Carolinas, Georgia and Florida), Source Edp is the largest specialized computer recruiting firm in the world. Right now, we represent over 1,500 Southeast based organizations having openings for computer people like you. A sample is presented below.

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Our Southeast clients will assume all expenses involved in interviewing and subsequent relocation (including costs for moving and temporary living). Also, you are under no obligation since all of our fees are assumed by our client organizations.

Call our special toll free number today.
If you are actively interested in pursuing a new position in the Southeast or just want some basic information about opportunities there, call Mike Taylor today, tonight or this weekend at 1-800-821-7700 x326 (Missouri residents please call 1-800-892-7655 x326). Our special toll free lines are open twenty-four hours a day, seven days a week, including Saturday and Sunday. As soon as we receive your inquiry, we'll get back to you with information about specific opportunities that may be of interest to you at your convenience. Then, if you'd like to explore any or all of them, we'll make the arrangements in confidence. If unable to call, please write:

Mike Taylor
Source Edp
Southeast Regional Headquarters
One Corporate Square
Atlanta, Georgia 30329

source edp

Regional Offices: Atlanta, Baltimore, Boston, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Encino CA, Fort Worth, Hartford, Houston, Irvine CA, Kansas City, Los Angeles, Miami, Milwaukee, Minneapolis, Nashua NH, New Orleans, New York, Northfield IL, Oak Brook IL, Palo Alto, Paramus, Philadelphia, Phoenix, Pittsburgh, Portland OR, Rolling Meadows IL, San Diego, San Francisco, Seattle, Southfield MI, St. Louis, St. Paul, Stratford CT, Toronto, Torrance CA, Union NJ, Washington DC, Wellesley MA, White Plains NY.

Florida
Fort Lauderdale, Jacksonville, Miami, Orlando, Tampa, St. Petersburg

Senior Project Managers—IMS.
Fortune 500 organization in the process of building a new corporate business systems development team seeks two Senior Analysts having a broadly based applications background and heavy exposure to data base. Multiple career paths available including systems and line operating management. To $32,000.

Sales Representatives—New Florida Branch.
Well known, highly profitable computer services firm seeks three marketeers for its first office in Florida. Prior exposure with either a hardware or services vendor and knowledge of commercial applications required. Estimated first year earnings $40,000.

DOS Systems Programmer.
Division of a national organization offers a unique opportunity for a DOS Software Programmer with Assembler skills to assume responsibility for all technical support. Position will grow to Project Manager within one year. To $22,000.

Systems Analyst—Data Base.
State-of-the-art IBM facility has need for an Analyst having at least two years experience in designing large-scale business applications. Strong emphasis on user interface skills. IMS preferred but not required. To $30,000.

Minicomputer Programmers.
Rapidly growing organization in the process of implementing a massive distributed processing network has openings for professionals with at least one year of Assembler, COBOL or BASIC experience. Prior sales support experience preferred but not required. To $24,000.

Consultant—Manager/MIS.
Southeast regional consulting firm seeks a Manager for its MIS group. Highly diverse applications background required. Prior Big 8 exposure preferred. Minimum travel. To $35,000.

Programmers—Gain IBM Experience.
Sophisticated large-scale facility seeks a number of Programmers having at least one year of COBOL experience involving commercial applications on any hardware. Will train in the latest IBM techniques. To $21,000.

Scientific Programmer—IISEE or IISCS.
Unique opportunity for a degreed professional having PDP 11 experience to work in simulation and network analysis areas. To $30,000.

Systems (Software) Programmer.
Leading Southeast organization seeks a professional having heavy JCL and utilities experience along with COBOL and HASP exposure to maintain OS/MVT operating systems. To $25,000.

Data Base Programmer Analysts.
Growing IBM facility seeks several COBOL Programmer Analysts with some exposure in data base design to assist in its first data base conversion. IMS training provided. To $26,000.

Mini Software Development—Distributed Processing.
Major Southeast apparel manufacturer is staffing its new marketing systems data center and seeks minicomputer professionals to assist in developing a distributed processing system with 40 remote sites. BASIC or COBOL programming experience required. To $25,000.

Georgia
Atlanta, Savannah, Macon, Columbus

Programmers—IMS Training.
Rapidly expanding firm seeks Programmers with IBM OS COBOL and Dump solving skills. Will be trained in multiple data bases (IMS, TOTAL, IDMS) and participate on new systems development teams. Exposure to structured programming with top-down design provided. To $25,400.

Mini Marketing Support—Patient Care.
Major health services vendor has just moved its corporate headquarters to the Southeast and provides opportunity for real-time interactive mini software development with customer contact. Multiple languages (any machine) required. To $26,200 + incentive bonus.

Marketing Representative—Management Opportunity.
Leading computer services firm seeks an experienced marketing professional to establish and build a new branch office in the Southeast. A successful record in selling hardware, timesharing, applications packages or service bureau required. No prior management experience necessary. Base to $25,000. Package to $60,000+.

Minicomputer Programmer Analysts.
Well-known national organization is starting a new minicomputer business applications development group using Data General RDOS Business Basic. It seeks minicomputer professionals at various levels to play key roles in this "leading-edge" effort. To $25,200.

MVS Systems Programmer—Management Training.
Major Fortune 500 company seeks a Software Specialist capable of leading an MVS conversion effort and then assuming the position of Technical Support Manager. To $33,000.

Programming Services Manager—Equity Potential.
New software company seeks professional to lead an on-line data base product package development team. Potential to assume partnership role in this multi-million dollar company based on performance. To $30,000.

Data Base Administrator.
Expanding organization with IBM 3033 OS/MVS environment is establishing its first data base and offers the opportunity to evaluate and select the DBMS. Will interface with top management. To $32,000.

IMS Software/Data Analyst.
Southeast university seeks an IMS Systems Programmer/DBA to establish and manage its first formal data base administration function. Free tuition, four weeks vacation and state-of-the-art large scale IBM environment provided. To $29,000.

COBOL Programmers—CICS Training.
International Fortune 500 organization seeks experienced COBOL Programmers to develop new applications software using structured techniques. Formal training in CICS provided. To $24,500.

Insurance Systems Analysts—Growth Environment.
Rapidly expanding Southeast based insurance organization seeks Analysts to lead a variety of new systems development projects. Planned growth will provide management opportunities within one year. 3033 IMS DB/DC environment. To $35,500.

MVS Systems Programmers—Mountains.
Major corporation located near a highly attractive ski area seeks an MVS specialist. VTAM and NCP expertise desired. To $29,750.

Carolinas
Greensboro, Raleigh, Winston-Salem, Durham, Charlotte, Greenville, Columbia

Major New MIS Expansion.
Recently approved three-year project for advanced MIS development and implementation has created the need to double the existing staff of this highly progressive organization. Current openings exist for Programmers, Analysts, Software Programmers, Computer Performance Specialist and Long-Range Planning Analyst. Computer environment includes on-line CICS, IMS, ADABASE, 303X, MVS. Salaries range from $18-$35,000.

Compiler Software Design.
Computer vendor seeks professionals to participate in the design of COBOL or FORTRAN compilers for advanced processors. Research environment. To $28,000.

Programmer Analyst—Gain CICS Exposure.
Newly installed IBM 370/138 CICS facility seeks a Programmer Analyst having at least one year of COBOL or BAL exposure. Coast location. To $22,000.

Senior Business Analyst—Management Training.
Corporate staff of a well-known organization seeks a senior professional for internal consulting. This is a highly visible position and leads directly to management. MBA preferred. To $30,000.

Programmer—Rural College Town Location.
Growing medium sized manufacturer seeks a Programmer with two years of COBOL exposure. Will work in the on-line systems area. To $22,000.

Process Control—Minicomputers.
Unique opportunity exists for professionals interested in the design and implementation of real-time data collection, process control (closed loop) and energy management systems. Skill in FORTRAN and minicomputers required. To $27,000.

Systems Support Manager.
Progressive organization seeks a person capable of managing a growing technical staff in a multiple CPU installation. Software includes DOS/VS, VM, CMS, ROSCOE, CICS, etc. Requires strong systems background, excellent written and oral skills, management exposure and ability to set guidelines for future hardware and software. To $32,000.

Junior Systems Programmers.
Outstanding opportunity for several professionals having at least one year of IBM BAL, OS/JCL and utilities exposure to become full-fledged Systems Programmers. University town environment. To $21,000.

Software Marketing Representative.
Well-known national organization seeks a professional to market sophisticated computer software to senior executives. Experience in selling timesharing, remote batch or general computer services preferred. $30,000-$50,000 first year potential.

HP 3000 Programmer Analyst. Manufacturing division of a Fortune 500 organization seeks a COBOL Programmer Analyst to participate in the implementation of an advanced production control system involving data collection. To $20,000.

On-Line Programmers—Resort Location.
Major manufacturer located in a highly desirable resort area seeks CICS Programmers for its on-line development group in an IBM 370 CICS/VS environment. Rapidly expanding company provides opportunity for some international travel. To $24,600.

SYSTEMS ANALYSTS

Take charge of your career in one of the country's finest computer centers

Truly unique opportunities are open at Shell in Houston for systems analysts who have these four vital considerations in mind.

- You want to work in a truly professional atmosphere.
- You want to be a key member of a small group in a large company.
- You want to work in an environment specifically designed for data processing.
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You'll be involved in developing a state-of-the-art Mass Storage System. In support of this project, you'll lend assistance to the functions of Data Base Administration, Network Control, and Performance Monitoring and Tuning.

The specific duties and responsibilities of this job function include, but are not limited to, the following:

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Performance Monitoring–operating system software-MVS, JES 2, etc., application software, hardware.

Required: We're looking for individuals who have 3-5 years' experience in programming, analysis, design and maintenance of IBM 370 software. You'll need a bachelor's or master's degree in computer or physical science.

Career advancement and fulfillment aside, Shell offers an outstanding compensation and benefits package.

Interested? Send your résume to B. E. Stubbs, Professional Recruiting, P.O. Box 2463, Houston, Texas 77001.

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We seek: individuals with BS / MS in Computer Science, Physics, Math or Electrical Engineering and experience in either of the disciplines outlined below:

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• structured software development • FORTRAN / IFTRAN / PL-1 • large systems — IBM 370 / CDC 6600 • familiarity with Radar Systems Simulation, and Data Reduction Systems desirable.

RADAR ANALYSTS

• generation of automated test plans for the control of radar operations and data collection • understanding of phased array radar systems, missile systems, radar data on reentry vehicles, radar observables and coherent waveforms is desirable.

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- Operating systems development

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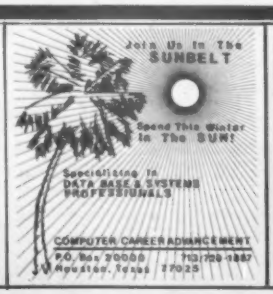
Prestigious, major health care institution in desirable California location seeks Programmer/Analysts. On-line experience, systems design, user interface, with COBOL or Assembler language. Outstanding benefits. **WESTERN HEALTH RESOURCES, P.O. BOX 48910, LOS ANGELES, CALIFORNIA 90048.**



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Conn.-based corp. seeks solid knowledge of MVS for visible senior role in support of Data Ctr. Exceptional position with billion-$ co. Salary to $35,000 (fee paid). Contact Pam Siegal.

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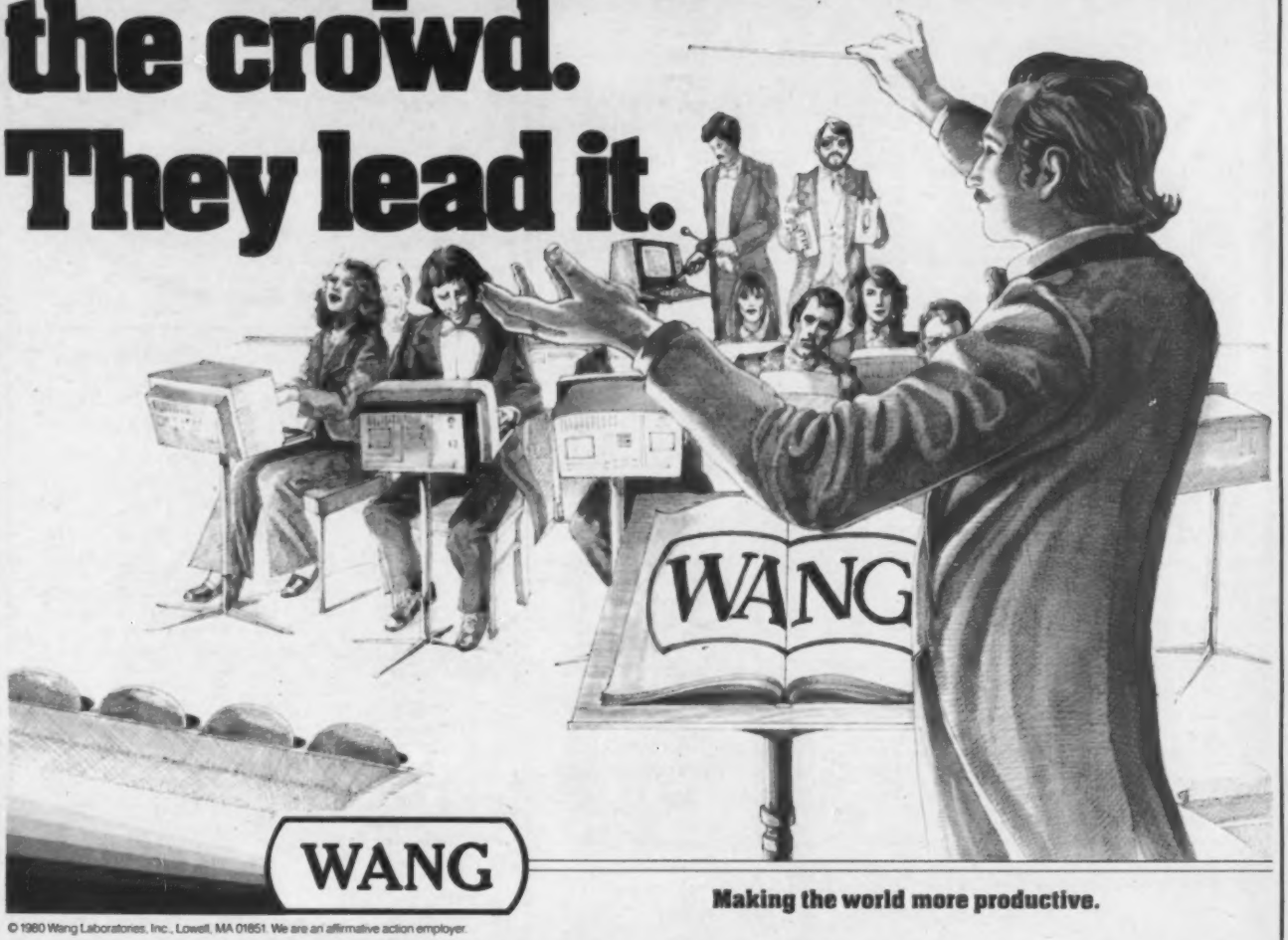
Wang software developers don't follow the crowd. They lead it.



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New data communications capabilities are currently under design for our VS computer system. The Wang VS provides highly advanced interactive and batch data processing capabilities and hosts Wang word processing, the world's most popular CRT-based word processing.

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We offer you an opportunity to help develop software capabilities for NCR's top-of-line mainframes. Our recently created Systems Engineering Group at Scripps Ranch, San Diego embodies a new approach that is shaping a whole new generation of interactive, transaction-oriented distributive processing systems. You will be working with advanced VLSI capabilities, and with mainframes that represent a quantum leap beyond any NCR has marketed before. You'll be using new concepts in data communication and Pascal-based languages . . . and having every opportunity to make significant advances in systems architecture and sophisticated data base management design. In short, if you are an ambitious software professional with a BSCS/BSEE, or better yet, a MSCS degree — and have 6 or more years of solid, closely relevant experience — here are positions that offer exceptional growth potential:

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Openings for Systems Architects or members of an architecture group require the ability to handle product definition and release coordination involving hardware, software and firmware for system development. Must have solid background in systems concepts, substantial software development experience, and knowledge of Pascal language.

We are also looking for experienced analysts for several projected openings in medium and large-scale, interactive software system development, who would provide technical guidance and leadership in Project Management and Architectural Services. In Project Management we require group leadership experience, ability to interface with corporate level organizations, and substantial exposure to transaction processing systems, structured design techniques, and high level programming languages.

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Will be the principal technical contributor responsible for the design and development of a major component for a Data Base Management System. Your assignments will span all areas of data base development including descriptive languages, data dictionary/directory support facilities, control systems, and benchmarks.

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Personnel Director

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Requires at least 2 years or more experience in program development on mini-computers, preferably D.E.C. including 1 year experience in statistics and graphics.

This position provides an attractive starting salary, excellent opportunity for advancement, company paid relocation, assistance in home selling, company paid insurance, three months temporary living allowance as well as many more benefits.

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Seven plus years of extensive experience in system design, programming and project management.

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Two to five plus years of experience utilizing improved productivity techniques in design and programming.

MVS SYSTEMS PROGRAMMER
One to three years experience with MVS, CICS, DL/I, ROSCOE, and IBM Utilities.

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Highly respected fin'l. services org. seeks innovative & creative analyst for manual & EDP sys. Prior exp. with work simplification, MTM, AOC, MCD, or predetermined time sys. a must. Strong oral & written skills req'd. for this user-oriented pos. Salary $22,000 (fee paid). Contact Paul Blanchard.

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90801
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Manager — Technical Staff

ITT/Advanced Technology Center, located in Shelton, Connecticut, has an immediate opening in its Operational Software group for a candidate to help develop an advanced local digital switching system — a pioneering project that will bring involvement with the latest technology.

The job function consists of 4 major areas of software development. (1) Design and development of the device handler programs for handling the switch network of an advanced multiprocessor telecommunications systems. (2) Software top level design, detailed design, coding and integrating of the above items which handle a distributed switch network. (3) Analysis of the real-time and space performance of the above item by using stochastic processes theory. (4) Development of the above items using structural design, CHILL high level programming language, 8086 assembly language and software development tools.

The person we seek must have a minimum of a Master's degree in Electrical Engineering. In addition, this person must have a good working knowledge of the following: skillful use of CHILL, assembly language, and microprocessor development system. The candidate must have in-depth knowledge of hardware circuits and the ability to perform analysis of LSI-based complex logic design in addition to skillful application of top-down structural design technique for large software development.

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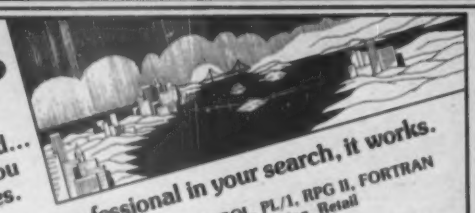

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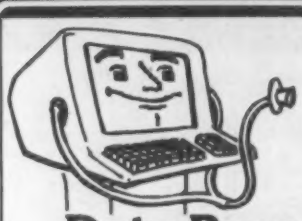

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PROGRAMMER

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Sangamo Weston's Data Systems Division, a manufacturer of high technology electronic equipment, has an opening for a Programmer in our Data Processing Department. The successful candidate will have at least 3 years of experience in a manufacturing environment with thorough knowledge of COBOL, AMAPS, CICS & DL/1 experience desirable. We currently use a 370/145 (DOS/VSE) and will install a 4341 in January.

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THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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SENIOR SYSTEMS PROGRAMMER

The Advanced Technology Center of CALSPAN CORPORATION, a major Scientific and Engineering Research Company, has a challengine position for a systems programmer at their Computer Center in Buffalo, New York.

The position requires an individual with a BS in Computer Science or related discipline, at least 5 years' experience in Computer System technical support, a thorough knowledge of JCL, Utilities and Assembler language. MVS/TSO operating system generation and maintenance experience is highly desirable. The major responsibilities include project management in network planning, configuration management, and system software planning. Technical leadership in real-time system support, system performance and scientific and business user consultation is required. The operating system consists of a 4 meg 3031 running VM, OS/MVT and MVS with a wide variety of program products.

If your background matches the area described above and you seek the opportunity to assist in directing a talented group of professional systems programmers, send your resume for prompt and confidential review to:

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EDP OPPORTUNITIES
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PROJ Ldr-Gen'l Ledger Fincl syst/MBA	$45K
PROJ Ldr-Foreign Exch 4300	$45K
PROJ Ldr-DDA, DOS/VS	$36K
S/A-On Line design Tandem to mainframe some travel	$32K
S/A-Wall St-Brokerage Applic	$38K
Bus Systems Wall St-P-S margins	$37-39K
P/A-COBOL OS dea. trn CICS	$25K+

NEW JERSEY

Proj-Ldr-Sales Mktg/OE dist.	$32K
SOFTWARE-MVS int'l comm corp	$35K
PROJ Ldr-Order entry-CICS	$36K
S/A-O.E. CICS MBA	$32K
PROJ Mgr 3033-O.S. MVS CICS	
S/A ACF/TCAM	$35K
S/A 3030X/158/33 IDMS COBOL	$35K

WESTCHESTER/CONN.

PROJ Ldr-Hands on IBM 4300 CICS IDMS COBOL	$40K
SR P/A-S/A CICS COBOL IDMS	$35K
PROJ Ldr-DOS/OS CICS DL1	$34K
ANAL/Prog-PDP11/50/60/70 RSX11-M ALP	$37K

CICS-COBOL-BAL/Database

PROJ Mgrs-CICS	$40K
PROJ Ldrs-CICS	$45K
SYSTEMS ANAL-CICS	$40K
PROG ANAL-CICS	$40K
SOFTWARE ANAL-CICS	$40K

Call Bill Berrell
(212) 349-3610
WM HARRIS ASSOC
150 Broadway, NY 10038 (agency)

MANAGER

Eight to ten years programming experience, IBM 360 or 370. B.S. Degree Business Administration, Computer Science or related area. Some supervisory experience preferred.

PROGRAMMER ANALYST

Three to five years programming experience, IBM 360 or 370, OS/VS-2, MVS, JCL, CICS. B.S. Degree Computer Science, Engineering, Math or related area. Excellent opportunity with growth oriented company.

Please mail resume to
Mr. McCullogh,
Jefferson Associates, Inc.,
Melrose Bldg.,
1121 Walker,
Suite 1310,
Houston, TX 77002
713/237-8495
EOE

SYSTEMS ENGINEERS/ TECHNICAL WRITERS/ SOFTWARE ENGINEERS

We're in the process of expanding . . .

. . . and we need talented individuals who prefer a career with challenge.

We currently have the following openings:

Systems Engineer — Systems Analysis/Programming and project management experience is desirable, as well as 6 months of experience with Tandem computers and 5 years experience in the DP industry.

Technical Writer — A thorough familiarity with data processing and technical writing, plus experience in software products and data communications.

Software Engineers — Experience in Systems, Communications, or high level applications programming, as well as TAL or a PL1-type language helpful. Current requirements in our Omaha, Chicago and Tampa offices.

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Submit resume in confidence to T. Barth at:

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CAREER OPPORTUNITIES

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Position available for Senior Systems Programmer. Individuals should possess 5-8 years system programming experience and be able to provide operating system, data base and communication network support in a SPERRY UNIVAC 1100 environment.

PROGRAMMER ANALYST

Innovative Programmer Analysts with 2-5 years recent systems development experience on large scale business computers are needed to take an active role in the design of batch and online business systems using COBOL as primary language.

Interested candidates should send resumes, including salary history, in confidence to:

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Professional Staffing FN-1
P.O. Box 40
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SOUTHERN OPPORTUNITIES

DP Mgr Must RPG II Prog	$30K
P/A basic or fortran	$25K
P/A 1yr RPG II	$18K
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P/A COBOL Mfg MRP	$24K
Prog COBOL CICS	$26K
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New Orleans, LA 70130
(504) 524-3773

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Our state-of-the-art data systems environment currently offers an opportunity for an individual with a telecommunications background to join our technical staff. This person will assist in planning and coordinating telecommunications activities for a large coast-to-coast network.

The ideal candidate will have a systems programming background with experience in MVS, NCP and VTAM along with a knowledge of data terminal equipment and data communications equipment.

Show your interest by applying to:

Mr. Randy Passman
UNITED TELEPHONE SYSTEMS INC.
UTSI/UDSI
2330 Johnson Drive
Westwood, KS 66205
913/676-3405

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DATA PROCESSING CAREERS INC

SYSTEMS PROGRAMMER

The nation's largest mortgage banking institution is seeking an experienced Systems Programmer.

The preferred candidate should have 2-4 years' experience and be able to install and maintain systems software on Data General C330/M600 series computers. A thorough knowledge of AOS and COBOL is required. IDEA experience is a definite plus.

We offer a career opportunity, excellent starting salary and fringe benefits.

Please submit resume with complete position and salary history in confidence to:

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Federal National Mortgage Association
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New EDP Position - Central N.J.
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Mfr seeks exp'd Q.A. Auditor or Sys Analyst to create, design, analyze test plans & stds for operations prgrmg sys & sys procedure for end-user. On-line CICS, SMB all ++, but not nec.

Contact Bette I. Kantor in confidence
(609) 921-8907

Bette I Kantor, Personnel
Research Park Bldg J
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SEATTLE/PORTLAND

D.P. PLANNING

A Fortune 100 industry leader headquartered in the beautiful Pacific Northwest is in the process of forming an ADVANCED PLANNING & TECHNOLOGY DEPT. in their Management Information Systems Division and have immediate openings in the following areas:

MANAGER OFFICE AUTOMATION

An excellent opportunity for a qualified "big picture" individual to direct the implementation of office systems. Immediate objective includes establishing priorities, policies and long range planning for the office automation function. Ideal candidate will, at a minimum, posess a bachelor's degree in Business, Computer Science or a related field; be knowledgable in the areas of word processing, document management, electronic filing/mail and posesss excellent written/oral communication skills. Exp. in DBMS and telecommunications a definite plus.

SENIOR PLANNING SPECIALIST

A dynamic position for the seasoned motivated professional to assist in forecasting corporate business information needs and planning resource utilization to meet future requirements. Requires advanced planning exp. in large scale data processing environment, good management/interpersonal skills, in-depth knowledge of computer systems. Ideal candidate will have appropriate degree, consulting background (internal/external), financial/capital forecasting knowledge and excellent business systems background.

SENIOR TECHNICAL SUPPORT SPECIALIST

The ideal position for the computer specialist interested in exploring "leadings edge" technological advances and able to interpret impact on corporate resources, systems, hardware and software requirement. Candidate must have a bachelor's degree or equivalent, and be hardware/software oriented with DBMS and/or communications experience. A solid IBM/HP product knowledge a definite plus.

SENIOR DECISION SUPPORT SPECIALIST

A quantitative oriented individual who can apply Operations Research tools to solve short and long range business problems in user environment will find this position all the challenge needed. Candidate should possess appropriate Math/OR degree have significant modeling/simulation exp. an be user oriented with good interpersonal skills.

SENIOR RESEARCH SPECIALIST

A challenging opportunity for the creative, "think tank" individual interested in exploring data processing equipment, software, concepts and organizational issues as far as 10 yrs. away. Education training and motivation must be oriented in direction of intersecting two or more technologies and products which result in shorter development cycles, higher quality products, reduced maintenance costs, better response to user needs. Ideal candidate must have apropriate degree and work exp. in either the university environment or private/public sectors.

For a confidential discussion of these and other positions contact:

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To direct the design and implementation of integrated compiler systems for a variety of host and target machines in such languages as Ada, Pascal, JOVIAL and FORTRAN.

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If you're planning to attend the SIGPLAN Symposium on the Ada programming language in Boston in December, we would be glad to arrange a day or evening meeting to discuss opportunities at Intermetrics.

If interested, call collect at: (617) 661-1840 any weekday 9 AM - 5:30 PM or write to:

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SYSTEMS ANALYSTS and PROGRAMMERS

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- Group health claims processing and reporting
- Medicare Part A or B claims processing
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This need is a result of business expansion and ambitious long-range growth plans, which provide good opportunities to work in an exciting environment while building a career with an industry leader.

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General American
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Director, Software Products Division

APPLIED DATA RESEARCH, INC.
Route 206 and Orchard Road, CN-8
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ADR

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(615) 329-1771

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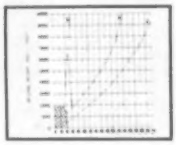
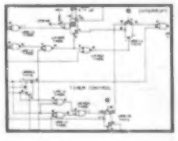
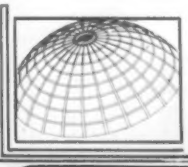




We have opportunities in various major cities including Long Island, Woodbridge, NJ, Philadelphia, Rockville, MD, Houston, Portland, OR and Irvine, CA. For confidential consideration please contact Jane DeRolph at TEKTRONIX, INC., 2 Research Court, Rockville, MD 20850. An Equal Opportunity Employer M/F/H.



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SENIOR SOFTWARE ANALYST

Honeywell Level 6

Johnson Wax has an immediate opening for an individual ready to move to a responsible position in advanced communication and networking. Successful experience on Honeywell Level 6 using Mod 400 is required. In addition, the individual must be able to spend some time in European travel to our subsidiary companies.

Johnson Wax is a multinational chemical specialties company located in a pleasant medium sized city between Milwaukee and Chicago. Coupled with professional growth opportunity, we offer a competitive salary plus an excellent benefits program including cash and deferred profit sharing. Individuals who have the above experience should send a detailed resume in confidence to R.W. Clark, Personnel Manager - Administrative and Professional, S.C. JOHNSON & SON, INC., 1525 Howe Street, Racine, WI 53403.

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Gary Nelson
& Associates Inc.
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San Rafael, CA 94913
(415) 479-5101

SYSTEMS ANALYSTS AND PROGRAMMERS

Job dissatisfaction, complacency, and frustration are the biggest obstacles to overcome to achieve one's career goals — and, never being challenged by new goals. Everyday new career opportunities pass us by because we are unaware of their existence. Let us keep you abreast of what your true value is in the market place. Absolutely no obligations, please call or write Keith Reichle, Data Processing Specialist.

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(704) 554-0771

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Phone: (317) 247-4447. Client companies assume all expenses including interview and relocation.

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Responsibilities: Write computer programs. Analyze existing programs and improve coding techniques.

Requirements: Require B.S. Computer Science and successful completion of State Civil Service Requirements.

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SYSTEMS ADMINISTRATOR

World Vision, an evangelical humanitarian organization, needs a Systems Administrator to lead a small technical support staff responsible for system software installation and maintenance, and application software installation. Requires 5 yrs exp as system analyst, prefer min of 1 yr exp with DEC-SYSTEM-10 or -20.

Send resume to John Minor, World Vision, 919 W. Huntington Dr., Monrovia, CA 91016.

EOE-M/F

PROJECT LEADER

GEOMET Technology, Inc. a rapidly expanding environmental and health consulting firm, is seeking a uniquely qualified individual to be Project Leader for the detail design and implementation of an interactive user-orientated retrieval system in the cancer research environment. This system concept incorporates aspects of statistical package manipulation and data base management system as well as features not common to either.

A successful candidate should have a computer science degree or equivalent experience, including knowledge of interpreters, user language development, and data and file structures; structured design; system implementation experience using PL/1 and S/370; some health area experience. Desirable skills include data base concepts, assembler, and biostaticatics. At least 7 years experience.

This position is in our Bethesda office. GTI offers competitive salaries, good growth opportunity, and a complete employees benefits package. Interested candidates, please send resume to:

Kathy S. McPherson, Personnel Director
GEOMET Technology, Inc.
15 Firstfield Road
Gaithersburg, MD 20760
EOE M/F/H

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SENIOR PROGRAMMER ANALYSTS
Commercial Applications Group
Qualified candidates must have 3+ years experience in COBOL programming on IBM 370 OS systems, full knowledge of financial systems, especially GENERAL LEDGER and ACCOUNTS PAYABLE, and some installation experience. Responsibilities will include heavy user interface, support, training and implementation. Moderate travel.

SYSTEMS PROGRAMMER and/or APPLICATION PROGRAMMERS
Operating Systems Software Group
Qualified candidates must have 3+ years extensive exposure to ALC with OS internals and OS MACROS, plus a background in DOS. Responsibilities will include user interface and support, and some new development opportunities for OS systems products. Emphasis on Tape Management Systems, Production Control Systems, DOS to OS conversions, and Automated Recovery Systems.

SENIOR PROGRAM ANALYST
Financial Industry Application Group
Qualified candidate must have 3+ years experience with ALC and/or COBOL, a background in IBM OS, DOS, CICS, DCS, DBS or VSAM, DL1, and skills in user seminars and project coordination. Emphasis will be on the banking industry, including EFT, MICR, Commercial and Installment Loans, and Customer Information files. Will assist in user education, training and installation. Limited travel.

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(214) 353-7181

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COMPUTER SYSTEMS RESEARCH SPECIALISTS

- **SECURITY AND PROTECTION**
- **NETWORK SECURITY**

To maintain its world leadership in the minicomputer industry, Digital is pursuing a variety of innovative research programs in a variety of disciplines.

If you join us, you'll focus on highly confidential systems security and protection programs, providing both research and consulting expertise to our product development and line groups.

Both positions require a Ph.D. in Computer Science or equivalent. Ideal candidates will have a background in kernelized secure operating systems design, formal verification methods, security models, and/or protocol verification.

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NETWORK SECURITY RESEARCH SPECIALIST

You will focus on the design of secure computer networks using both encryption and secure kernel technology. A major area of reesearch will involve the interaction between communications security and secure operating systems design. You will work with the DECnet, ARPAnet, X.25 nets, and high-speed local area networks.

To apply, please send resume, indicating salary history and position of interest to: John DiPietro, Digital Equipment Corporation, Dept. B1124 3807, 146 Main St., Maynard, MA 01754.

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SR PROGRAMMER **TO $30,000**
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PROJECT LEADER **TO $30,000**
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Your technical associate degree (bachelor's degree preferred) and appropriate combination of formal programming/problem analysis, systems analysis and project control training and 1-6 years business systems application development experience qualifies you for a position at Tennant. In depth working knowledge of COBOL programming language essential.

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We are currently searching for Programmers/Analysts for client companies in the following cities: BOSTON, WASHINGTON, D.C., HOUSTON, LOS ANGELES, SEATTLE, PHILADELPHIA and ORLANDO. These positions require applications/systems programming or design/analysis experience using COBOL, FORTRAN, PL/1 or Assembly Language with IBM 360/370, UNIVAC 1108/1110, H6000, DEC 10/20, PDP 11, HP 3000 or similar systems. Knowledge of CICS, TOTAL, SYSTEM 2000 or similar DBMS desired. Degree in Computer Science, Math or Engineering a plus. Salaries to $33,000. Call 800-638-0254 or submit resume to:

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Work in growing information systems division of 452 bed community hospital located in central California. Beautiful recreational area near 3 national parks. Department plans include sophisticated on line distributive processing with DEC-20 and PDP-11 series. Programming languages include MACRO, COBOL, and FORTRAN. Applicants should have at least 2 years programming in business and hospital applications. Send resume and salary requirements to:

Personnel Dept.
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We're seeking a sales support specialist to work with computerized energy management systems — designed, manufactured and installed by NSC. You will act as a liaison between customer engineering departments and electrical contractors. You should also have a background in refrigeration and HVAC equipment.

Please send your resume, in complete confidence, to Nancy McAuliffe, Professional Employment, Department 3-51-251, Sunnyvale, CA 94088. An affirmative action employer.

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Cherry Hill, New Jersey 08002
(609) 667-4488

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Michael Nacey
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Pete Skorich
Manager Information Systems

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Send resume to: Daniel J. Fleming, Mathematics Dept., St. Lawrence University, Canton, N.Y. 13617. An equal opportunity employer m/f.

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A full-time position to teach all phases of Computer Programs. Also will work with curriculum development. Must have knowledge of BASIC, COBAL, RPG, FORTRAN, Job Control, System Analysis, and Data Base Concepts. Qualifications: Bachelor's degree in Computer Science or Education plus two years related experience. Closing date for applications is November 30, 1980. Excellent salary and fringe benefits. Send letter of application and resume' to:

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Rates: Open rate is $73.50 per column inch. Columns are 2" wide. Minimum ad size is 2 column inches (1 column wide by 2 inches deep), and costs $147 per insertion. Additional space is available in half-inch increments. Some sample sizes and costs are shown.

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In addition to base salary and an excellent benefits package, persons in this position will participate in a bonus plan which is tied to accomplishment of assigned objectives and degree of travel required.

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Computer Sciences Corporation

Programmers

Operating System Development

Computer Sciences Corporation (CSC), one of the world's largest computer services companies and the largest independent computer software firm, has career opportunities in Operating System Development at its El Segundo facility.

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Develop and utilize software instrumentation and analytical packages to study operating system performance.

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Gemini Information Systems
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Englewood, CO 80111
303/773-1805
OEO

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(214) 363-3300

Finance & MIS Department: School of Business.

Permanent position; Assistant Professor/ Associate Professor rank. Beginning date: Jan., 1981 or sept. 1981 depending upon availability. Academic preperation: PhD or DBA with major concentration in Management Information Systems. Successful training and experience in COBOL programming, Data Base Management Systems, Systems Analysis and Design, and Management Information Systems required. Knowledge of timesharing, distributive systems and development of Business Information Systems are desired. Duties include: teach 12 semester hours of undergraduate or 9 graduate semester hours. Advise students, serve on faculty committees, assist in developing curriculum that is relevant to MIS field, participate in academic and professional activities. Application deadline: Nov. 28, 1980. Appointment date Dec. 19, 1980. Send applications to: Mr. James Solak, Finance & MIS, 203 McElhaney, Indiana University-Pennsylvania, Indiana, PA 15705.

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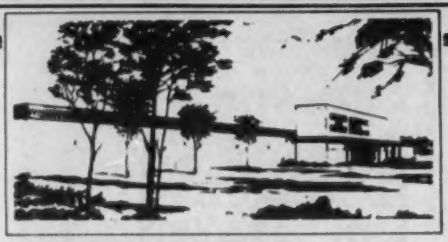

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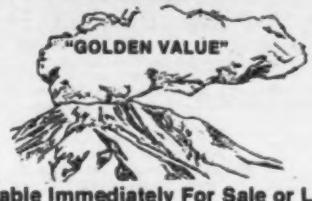

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Request for Proposal Number 615, due 3:30 p.m., Wednesday, December 17, 1980, for the acquisition of services for the conversion of a small system written in 360/20 RPG to a vendor's system and for ongoing data entry, processing and program maintenance on the converted system.

Request for Proposal Number 616, due 3:30 p.m., Thursday, January 22, 1981, for an Admissions/Registration and/or Accounts Receivable software systems and implementation services for a teaching hospital. Vendors interested in bidding must attend a bidder's conference on Thursday, December 11, 1980, at 10:00 a.m. at the Central Data Processing Authority. Specifications may be obtained for a non-refundable $25.00 fee by certified check or money order only (no cash) made out to the Central Data Processing Authority.

Detailed specifications may be obtained from the CDPA office. The CDPA reserves the right to reject any and all bids and proposals and to waive informalities.

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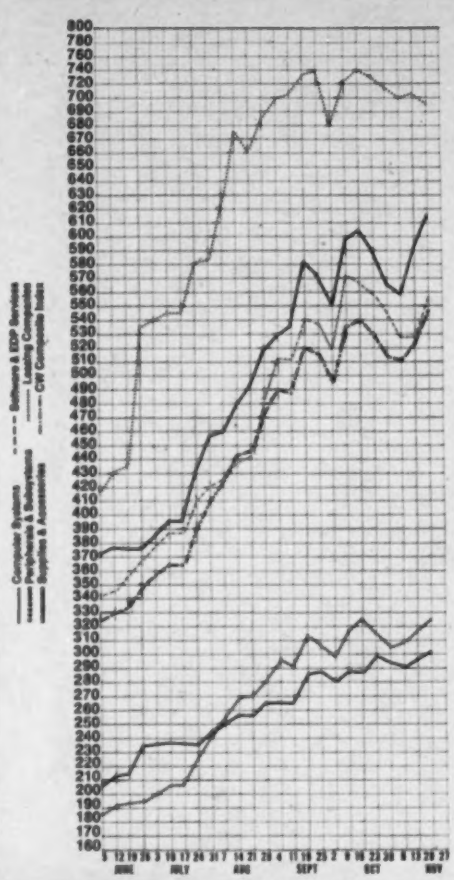

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A	AMDAHL CORP	15- 42	34 5/8	+2 5/8	+8.2
N	BURROUGHS CORP	47- 88	47 1/4	-3 1/4	-6.4
O	COMPUTER AUTOMATION	9- 27	24	+1	+4.3
N	CONTROL DATA CORP	35- 77	72 1/2	+2 1/2	+3.5
N	CRAY RESEARCH INC	30-100	98	+6 3/4	+7.2
N	DATA GENERAL CORP	46- 87	75 5/8	+2 5/8	+3.5
N	DATAPOINT CORP	44-113	111	+17	+18.0
N	DIGITAL EQUIPMENT	52- 97	95 1/4	+5 5/8	+6.2
A	EECO INC	9- 24	24 1/8	+1 5/8	+7.2
N	ELECTRONIC ASSOC.	6- 12	8 1/4	- 1/2	-5.7
N	FOUR-PHASE SYSTEMS	20- 49	27 7/8	+ 1/8	+0.4
N	FOXBORO	31- 57	56 1/4	+2 3/8	+4.4
O	GENERAL AUTOMATION	7- 19	9 1/8	+ 1/8	+1.3
O	GRI COMPUTER CORP	1- 3	1 1/8	0	0.0
N	HEWLETT-PACKARD CO	46- 95	94 3/4	+10 3/4	+12.7
N	HONEYWELL INC	65-101	99 5/8	+5 1/8	+5.4
N	IBM	58- 79	71 3/8	+ 1/2	+0.7
O	MAGNUSON COMP SYSTS	20- 45	45	+6 1/4	+16.1
N	MANAGEMENT ASSIST	9- 25	20 3/4	-3	-12.6
O	MANUFACTURING DATA S	22- 75	75 1/4	+1 3/4	+2.3
O	MINI-COMPUTER SYST	2- 6	3 1/8	0	0.0
O	MODULAR COMPUTER SYS	9- 31	27 3/4	- 1/2	-1.7
N	NCR	52- 82	73	+3 1/4	+4.6
N	PRIME COMPUTER INC	15- 56	55 5/8	+7 3/8	+15.2
N	PERKIN-ELMER	26- 69	66 5/8	-2 3/8	-3.4
N	SPERRY RAND	42- 80	59	+5 1/8	+9.5
A	SYSTEMS ENG. LABS	11- 46	46 1/4	+4 1/8	+9.7
O	TANDEM COMPUTERS INC	13- 68	64 1/2	0	0.0
N	TEXAS INSTRUMENTS	79-144	142	+7 3/4	+5.7
A	WANG LABS.	17- 60	43 1/2	-1	-2.2
	LEASING COMPANIES				
O	BOOTHE FINANCIAL CP	13- 27	22	0	0.0
N	COMDISCO INC	6- 23	22 7/8	+4 1/8	+22.0
A	COMMERCE GROUP CORP	1- 2	1	0	0.0
A	COMPUTER INVSTRS GRP	2- 4	1 5/8	- 1/2	-23.5
O	CONTINENTAL INFO SYS	2- 15	5	+ 1/8	+2.5
M	DATRONIC RENTAL	2- 5	4 1/4	0	0.0
A	DCL INC	3- 6	2 7/8	- 1/4	-8.0
N	DPF INC	5- 12	6 3/4	- 1/8	-1.8
N	ITEL	1- 15	1 1/4	0	0.0
O	LEASPAC CORP	1- 2	5/8	- 1/8	-16.6
A	PIONEER TEX CORP	2- 4	3 5/8	0	0.0
N	RELIANCE GROUP INC	24- 79	69 1/2	0	0.0
N	U.S. LEASING	12- 24	23	+1 7/8	+8.8
O	ADVANCED COMP TECH	1- 6	5 3/8	+ 1/2	+10.2
O	ANACOMP INC	7- 24	22 7/8	+3 1/2	+18.0
O	ANALYSTS INTL CORP	3- 12	11 1/2	+ 1/4	+2.2
A	APPLIED DATA RES.	6- 24	20 3/4	-1 1/2	-6.7
N	AUTOMATIC DATA PROC	31- 52	51	+1 3/4	+3.5
O	CDA COMPUTER ASSOC	13- 28	22 1/4	-1	-4.3
O	COMPUTER HORIZONS	1- 5	2 3/4	0	0.0
O	COMPUTER NETWORK	4- 9	7 1/2	0	0.0
N	COMPUTER SCIENCES	11- 30	18 7/8	- 3/8	-1.9
O	COMPUTER TASK GROUP	1- 22	23 1/4	+5 3/4	+32.8
O	COMPUTER USAGE	2- 10	8 1/4	+1 1/4	+17.8
O	COMPUT AUTO REF SVC	4- 11	11	+2	+22.2
O	COMSHARE	11- 21	16 3/4	- 1/4	-1.4
O	CULLINANE CORP	9- 39	38 1/2	+7 1/4	+23.1
O	DATA DIMENSIONS INC	1- 6	1 3/8	0	0.0
O	DATATAB	1- 4	1 1/8	0	0.0
O	DSI CORP	4- 9	8 1/2	+1	+13.3
N	ELECTRONIC DATA SYST	19- 37	33 5/8	+1 5/8	+5.0
O	INFORMATICS INC	9- 25	23 1/4	+3 1/4	+16.2
O	INSYTE CORP	1- 3	1 3/4	0	0.0
O	IPS COMPUTER MARKET.	2- 4	3	0	0.0
O	KEANE ASSOCIATES	3- 9	5 1/2	- 1/4	-4.3
O	KEYDATA CORP	1- 5	3/4	+ 1/8	+20.0
A	LOGICON	12- 29	28 5/8	- 3/8	-1.2
O	MATHEMATICA INC	5- 18	12 1/2	- 3/4	-5.6
O	MATHEMATICAL APP GRP	7- 33	20 1/2	+2 1/2	+13.8
O	NATIONAL DATA CORP	10- 31	29 3/4	+1 3/8	+4.8
N	PLANNING RESEARCH	5- 13	11 5/8	+ 3/4	+6.8
O	PROGRAMMING & SYS	1- 1	3/4	+ 1/8	+20.0
O	RAPIDATA INC	4- 9	8 1/2	+ 7/8	+11.4
O	REYNOLDS & REYNOLD	21- 34	23 1/2	+1 1/4	+5.6
O	STSC INC	6- 20	19 1/2	- 1/4	-1.2
O	SCIENTIFIC COMPUTERS	6- 29	28	+ 1/2	+1.8
N	TYMSHARE INC	34- 87	84 5/8	+10 3/8	+13.9
A	URS SYSTEMS	5- 16	16 3/8	+ 1/8	+0.7
N	WYLY CORP	4- 20	16 5/8	- 1/8	-0.7
	PERIPHERALS & SUBSYSTEMS				
N	AM INTERNATIONAL	13- 24	14 7/8	- 3/8	-2.4
N	AMPEX CORP	14- 34	32	+ 5/8	+1.9
A	ANDERSON JACOBSON	9- 23	22 5/8	+3 3/8	+17.5
N	APPLIED DIG DATA SYS	5- 12	11 7/8	0	0.0
O	AUTO-TROL TECHNOLOGY	18- 62	48 1/2	- 1/2	-1.0
O	BEEHIVE INT'L	3- 22	21 5/8	+4	+22.6
A	BOLT,BERANEK & NEW	12- 35	33 1/2	+2 7/8	+9.3
N	BUNKER-RAMO	17- 41	39 5/8	- 5/8	-1.5
O	CAMBRIDGE MEMORIES	1- 9	3 1/8	- 3/8	-10.7
N	CENTRONICS DATA COMP	20- 55	30 3/8	-2	-6.1
A	CETEC CORP	3- 7	6 1/4	- 3/8	-5.6
O	COMPUTER DEVICES INC	5- 10	6 3/4	- 1/2	-6.8
O	COGNITRONICS	1- 10	9 5/8	+1 3/4	+22.2
O	COMPUTER COMMUN.	4- 10	3 1/8	+ 3/8	+13.6
O	COMPUTER CONSOLES	4- 29	23 3/4	0	0.0
O	COMPUTER TRANSCEIVER	1- 5	5 1/8	+1 1/8	+28.1
N	COMPUTERVISION CORP	24- 92	80	+ 7/8	+1.1
N	COMRAC CORP	13- 25	18 5/8	+ 3/8	+2.0
A	DATA ACCESS SYSTEMS	6- 20	18 1/4	+ 1/2	+2.8
A	DATA PRODUCTS CORP	11- 35	33 5/8	- 3/8	-1.1
O	DATUM INC	2- 5	4 3/8	0	0.0
O	DECISION DATA COMPUT	2- 6	4 1/8	- 1/4	-5.7
O	DELTA DATA SYSTEMS	1- 3	1 7/8	0	0.0
N	DOCUMATION INC	7- 27	18	+ 3/4	+4.3
O	DATABANK CORP	6- 37	11 7/8	- 1/2	-4.0
N	ELECTRONIC M & M	3- 9	8 5/8	+1 1/8	+15.0
O	EVANS & SUTHERLAND	21- 83	82 1/2	+1 1/2	+1.8
O	FABRI-TEK	1- 4	2 5/8	- 1/4	-8.6
O	GENERAL COMPUTER SYS	1- 7	6	- 3/8	-5.8
O	GENERAL DATACOMM IND	12- 30	28 3/4	+ 1/2	+1.7
O	GENERAL TERMINAL CP	1- 4	2 1/2	+ 1/8	+5.2
N	HAZELTINE CORP	12- 33	28 3/8	-1 1/2	-5.0
N	HARRIS CORP	25- 55	55 3/8	+3 7/8	+7.5
O	INFORMATION INTL INC	8- 15	12 1/4	- 1/4	-2.0
O	INTEL CORP	23- 50	48 3/4	+3 3/4	+8.3
O	INTERSIL	13- 34	33 1/2	+ 1/4	+0.7
A	LUNDY ELECTRONICS	4- 17	11 1/4	+ 3/8	+3.4
O	MSI DATA CORP	5- 16	14 1/8	+1 1/8	+8.6
N	MEMOREX	10- 34	14 1/8	- 7/8	-5.8
N	MOHAWK DATA SCI	10- 31	27 1/8	+ 7/8	+3.3
O	OMEX	2- 12	12	0	0.0
A	PARADYNE CORP	10- 65	65	+1 1/4	+1.9
A	PENRIL CORP	9- 15	13 5/8	- 1/4	-1.8
O	RAMTEK CORP	10- 18	18 1/4	+1 1/4	+7.3
O	RECOGNITION EQUIP	5- 21	19 7/8	+1 3/4	+9.6
O	SCAN DATA	1- 5	1 7/8	-	-3.1
N	STORAGE TECHNOLOGY	12- 25	24 5/8	+1	+4.2
O	SYKES DATATRONICS	14- 50	35 1/4	+1 3/4	+5.2
O	T BAR INC	14- 24	22 1/4	+2 3/4	+13.7
A	TEC INC	3- 9	5 1/4	- 1/8	-2.3
N	TEKTRONIX INC	42- 70	67 3/4	+2 3/4	+4.2
N	TELEX	3- 6	5 3/4	- 1/8	-2.1
O	TESDATA SYSTEMS CP	8- 26	14 3/4	+1	+7.2
A	TIMEPLEX INC	7- 30	30	+2 3/4	+10.0
O	WILTEK INC	1- 3	2 1/8	+ 1/8	+6.2
	SUPPLIES & ACCESSORIES				
A	AMERICAN BUS FORMS	8- 15	14 3/8	+ 5/8	+4.5
O	BALTIMORE BUS FORMS	1- 2	1	0	0.0
N	BARRY WRIGHT	8- 22	20 3/4	- 1/2	-2.3
O	CYBERMATICS INC	1- 2	1 1/4	- 1/8	-9.0
A	DUPLEX PRODUCTS INC	11- 16	13 7/8	+ 3/8	+2.7
N	ENNIS BUS. FORMS	13- 21	16 1/4	0	0.0
N	3M COMPANY	46- 63	60	+2 5/8	+4.5
O	MOORE CORP LTD	27- 37	32 7/8	+1 1/8	+3.5
N	NASHUA CORP	20- 35	28 3/8	+1 1/4	+4.6
O	STANDARD REGISTER	22- 35	31	0	0.0
A	TAB PRODUCTS CO	9- 27	25 3/8	+2 1/2	+10.9
N	WABASH MAGNETICS	11- 25	24 1/2	+2 1/8	+9.4
N	WALLACE BUS FORMS	23- 52	48 5/8	- 3/4	-1.5

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
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